Office Automation Systems

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Preface

This book presents a foundation of information for senior managers and others interested in the quality of the office environment. It also tries to answer the difficult "So what?" questions by which information becomes the basis for action. Its form and content seek to illustrate a practical approach - a systematic way to address the quality of the office environment in a comprehensive manner without being swamped with information and paralyzed into inaction.

In recent years, the office workforce has been downsized, restructured, and reengineered: office workers have been the focus of total quality management and the search for excellence; they have been automated and empowered - all with the objective of giving them the capability, the motivation, and the support to be more productive and more effective.

The quality of the physical work environment directly affects the success of all these initiatives. There is perhaps no more concrete demonstration of corporate commitment to these programs than to improve people's physical surroundings. The office environment is an immediate and ever-present expression of corporate culture that employees see, feel, hear, and live with every working day. The more it supports them in their work activities, the less quickly they will become fatigued, the fewer sick days they will have, and the more energy they will have available for the work at hand.

The better the quality of the physical work setting, the less aware people are of its contribution. At its best, the office environment is a seamless background that the occupants hardly notice. At its worst, it is a major obstacle to productive effort - a place where no real work can be done. People can be found hiding out in cafeterias, empty conference rooms, and at home to escape office facilities that are too disruptive, too uncomfortable, or that make them feel too unwell to do their mind's best work.

Any program to increase the productivity and effectiveness of office-based work should employ the design, management, and quality of the work environment to maximum advantage. The physical office setting should present an image of corporate culture consistent with the organization's policies and principles - an alignment of stated goals and concrete action.

To achieve the aim of this book , this book include the next chapters :

Chapter 1: Office Automation Overview

Chapter 2 : The changing nature of office work

Chapter 3 : Technology , Teams changing needs

Chapter 4 : Confidentiality and security issues with OA

Chapter 5 : Approaches to OAS analysis and design

Chapter 6 : Selecting the best of harsware and software for automation

Chapter 7 : Office productivity tools

Chapter 8 : Office Automation in small business

Chapter 9 : Virtual Office

Chapter 10 : Office Automation and telecommunicatios

Chapter 11 : Microsoft Office 2000

their company's computer network and databases. Telecommuting workers and their colleagues also use electronic mail or voice mail to communicate with each other about job assignments.

Telecommuting is becoming a significant work alternative at major corporations and a common approach for many independent professionals. It seems to be most attractive to people whose jobs involve a lot of individual work, such as programmers, systems analysts, writers, consultants, and so on. It is especially helpful for handicapped persons and working parents of young children. Telecommuting is also being promoted as a way to conserve resources that would have been used to commute to work by cars and other means of transportation. However, studies have shown that telecommuting is not appropriate for many jobs and people. Productivity and job satisfaction seem to suffer unless workers spend several days each week at the office or other work sites with their colleagues. So telecommuting is considered only a temporary or partial work alternative for many knowledge workers [9].

Electronic Publishing Systems

Electronic publishing systems have transformed today's office into an in-house publisher of business documents. *Word processing* and *desktop publishing* are the information technologies that give the modern workplace electronic publishing capabilities. Word processing was the first, and is still the most common, office automation application. Word processing is the use of computer systems to create, edit, revise, and print text material. As we mentioned in Chapter 5, word processing involves manipulating text data (characters, words, sentences, and paragraphs) to produce information products in the form of documents (letters, memos, forms, and reports).

Desktop Publishing

One of the major applications in office automation is desktop publishing. Organizations can use desktop publishing systems to produce their own printed materials. They can design and print their own newsletters, brochures, manuals, and books with several type styles, graphics, and colors on each page. What constitutes a desktop publishing system? Minimum hardware and software requirements include:

- A personal computer with a hard disk.
- A laser printer or other printer capable of high-quality graphics.
- Software that can do word processing, graphics, and page makeup.

Word processing packages and page composition packages are used, typically, to do word processing, graphics, and page makeup functions. For higher-quality printing, end users need to invest in a more powerful computer with advanced graphic capabilities, a more expensive graphics and page makeup package with more extensive features, and a laser or other printer with a greater variety of capabilities.

How does desktop publishing work? Here are the major steps in the process.

1. Prepare your text and illustrations with a word processing program and a graphics package. Use an optical scanner to input text and graphics from other sources. You can also use files of clip art, predrawn graphic illustrations provided by your software or available from other sources.
2. Use the page composition program to develop the format of each page. This is where desktop publishing departs from standard word processing and graphics. Your video screen becomes an *electronic pasteup board* with rulers, column guides, and other page design aids.



Richard Pasley

FIGURE 8.20
Desktop publishing in action. The video display shows the use of page makeup software to produce a newsletter on a laser printer

3. Now merge the text and illustrations into the page format you designed. The page composition software will automatically move excess text to another column or page and help size and place illustrations and headings. Most page composition packages provide WYSIWYG (What You See Is What You Get) displays so you can see what the finished document will actually look like.
4. When the pages on the screen look the way you want them, you can store them electronically on your hard disk, then print them on a laser printer or other printer to produce the finished printed material. See Figure 8.20.

Many word processing packages now provide limited desktop publishing features. However, the desktop publishing process is not as easy as it sounds for the casual end user. Projects involving complex layouts require experience, skill, and a knowledge of graphics design techniques. However, advances in software have made the job easier in terms of ease of use and helping end users do a better job of graphics design. For example, predesigned forms for various types of printed material (called *templates* or *style sheets*) are frequently provided by many software packages.

Image Processing

Image processing is another fast-growing area of office automation. It allows end users to electronically capture, store, process, and retrieve images of documents that may include numeric data, text, handwriting, graphics, and photographs. **Electronic document management** (EDM) is based on image processing technology. However, it views a document as "something that has been authored for human comprehension." Thus, an electronic document is not just an electronic image of traditional documents as described earlier. It may also take the form of a digitized "voice note" attached to an electronic mail message, or electronic images for a color graphics presentation [6, 21].

FIGURE 8.21
An image processing system.



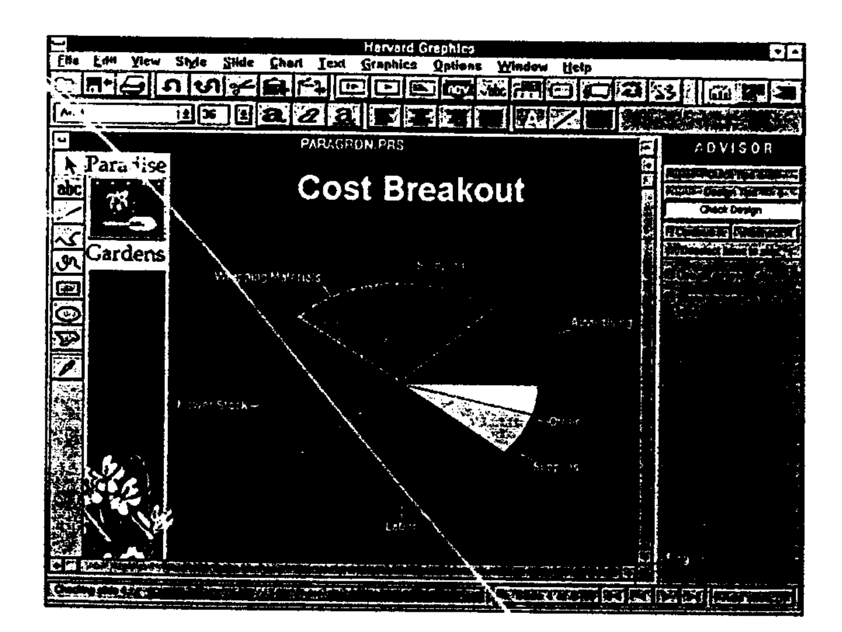
Courtesy of IBM Corporation.

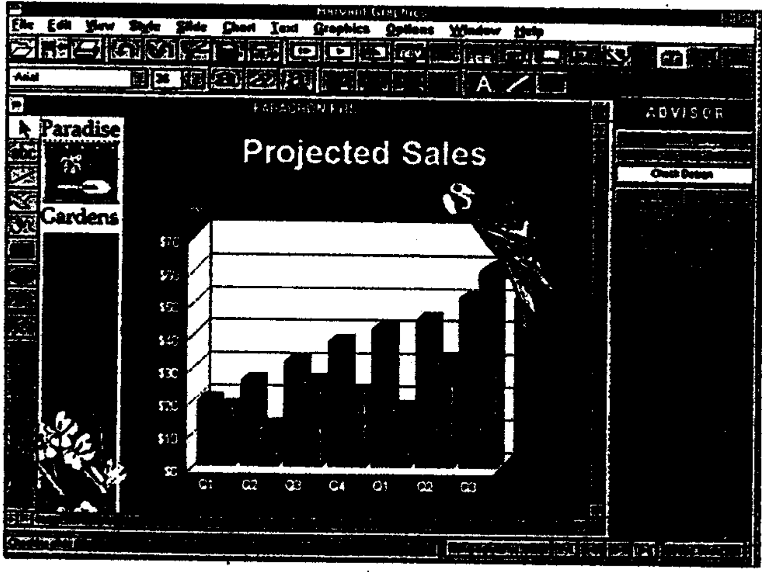
Electronic document management may interface with other electronic document preparation systems such as word processing, desktop publishing, electronic mail, and voice mail. However, one of the fastest growing application areas is *transaction document image processing*. Documents such as customer correspondence, sales orders, invoices, application forms, and service requests are captured electronically and routed to end users throughout the organization for processing. For example, a customer application form for a bank loan can be captured by optical scanning, indexed by the image database management system, stored on optical disk drives, electronically routed to various end user workstations for editing and financial and credit analysis, and then rerouted to a loan officer's workstation where the loan application decision is made. Such image processing and document management systems have shown productivity improvements of 20 to 25 percent, as well as significant cost savings [3, 11]. See Figure 8.21.

Computer Graphics

Which type of output would you rather see: columns of numbers or a graphics display of the same information? Most people find it difficult to quickly and accurately comprehend numerical or statistical data that is presented in a purely numerical form (such as rows or columns of numbers). That is why, typically, presentation graphics methods, such as charts and graphs, are used in technical reports and business meetings. As we mentioned in Chapter 5, microcomputer and graphics software packages give end users a variety of computer graphics capabilities, ranging from computer-aided design to computer art to presentation graphics. Graphics can be presented as video displays, printed material, transparencies, and color slides. Computer-based presentations containing many different graphics display screens are common, and the use of multimedia presentations with sound, animation, and video clips is growing. See Figure 8.22.

Computer graphics has been used for many years in design applications called computer-aided design (CAD). Engineers use CAD to design complex mechanical and electronic products and physical structures. Architects use CAD to





Courtesy of Software Publishing Corporation.

FIGURE 8.22
Presentation graphics displays. Note the use of color, line and bar graphs, three-dimensional graphics, and other graphics images.

help them design buildings, work spaces, and other environments. Computer graphics also assists researchers in analyzing volumes of data and process control technicians in monitoring industrial processes.

Presentation Graphics

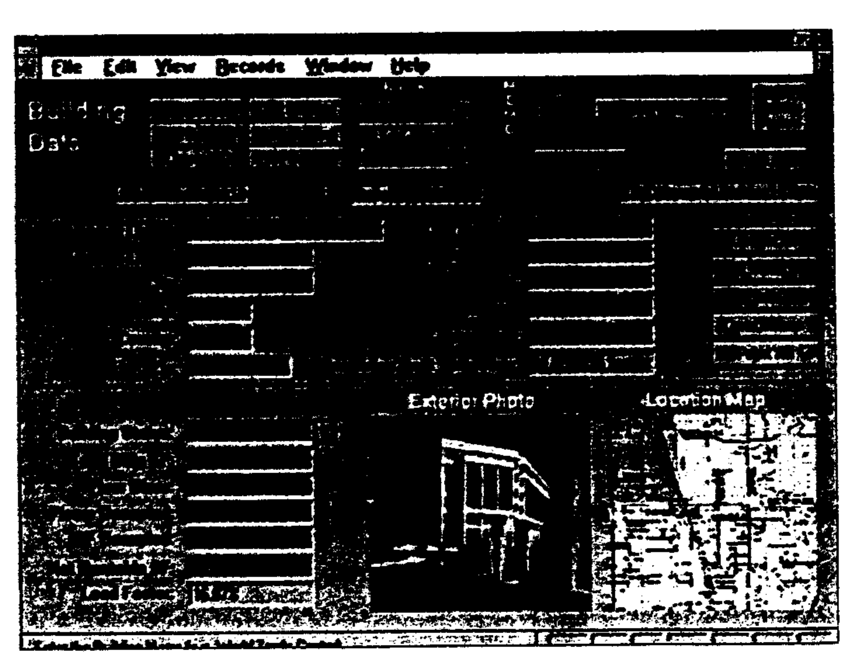
The goal of **presentation graphics** is to provide information in a graphical form that helps end users and managers understand business proposals and performance and make better decisions about them. This includes the use of line and bar graphs, pie

charts, and pictorial charts using a variety of symbols. So instead of being overwhelmed by large amounts of computer-produced data, graphics displays can assist managers in analyzing and interpreting information presented to them.

Presentation graphics does not totally replace reports and displays of numbers and text material. Such methods are still needed to present the detailed information that many applications require. However, presentation graphics is becoming the usual method of presenting business information in reports, meetings, and other business presentations. That's because trends, problems, and opportunities hidden in data are easier to spot and communicate when using graphics displays. For example, presentation graphics makes it easier for a marketing manager to see complex market trends and communicate potential market problems and opportunities to the members of a sales team.

Multimedia Presentations

Information technology is enabling **multimedia presentations** for training employees, educating customers, making sales presentations, and adding impact to other business presentations. Business multimedia goes far beyond traditional forms of numeric, text, and graphics presentations. Multimedia methods of presentation give end users information in a variety of media, including text and graphics displays, voice and other digitized audio, photographs, and video clips. However, many multimedia systems go beyond one-way information presentations. They allow end users to select the form and content of the information presented and browse through the information in a random way, instead of being tied to the sequential access of information. Let's take a closer look now at the information technologies that make multimedia possible. See Figure 8.23.



Courtesy of Computerworld

FIGURE 8.23
An example of a multimedia business presentation.

Multimedia Hardware and Software

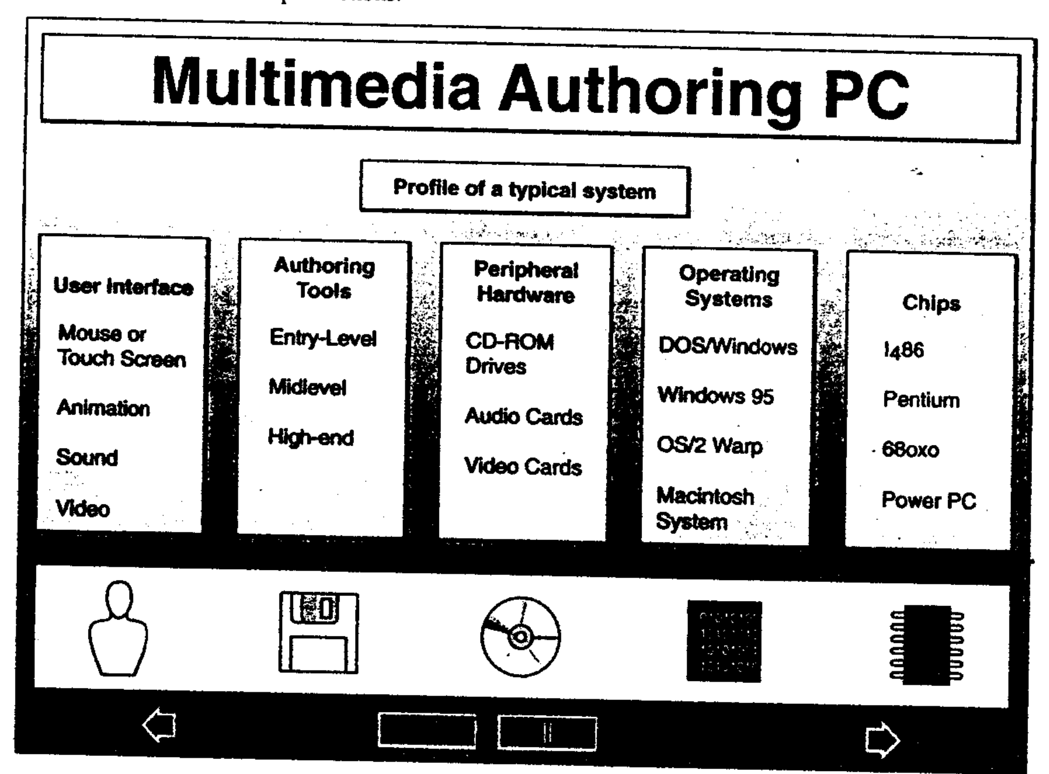
Figure 8.24 outlines the basic hardware and software requirements of a typical microcomputer system that enables you to create, as well as enjoy multimedia presentations. Of course, owners of low cost *multimedia PCs* marketed for home use do not need *authoring software* or high-powered hardware capabilities in order to enjoy multimedia games and other entertainment and educational multimedia products.

But if you want to create your own multimedia productions, you will have to spend several thousand dollars to put together a high-performance multimedia system. As Figure 8.24 shows, this includes CD-ROM players, stereo speakers, high-resolution color graphics monitors, sound boards, video capture boards, a high-performance microprocessor, at least 16 megabytes of RAM, and over 300 megabytes of hard disk capacity. Software such as authoring tools, and programs for image editing and graphics creation can add several thousand more dollars to the startup costs of your multimedia authoring system [19].

Hypertext and Hypermedia

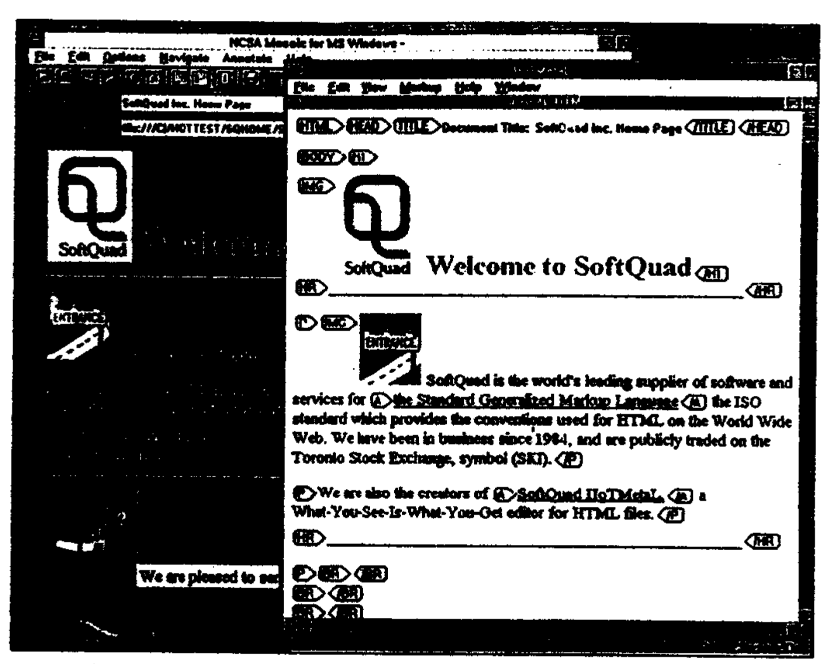
Hypertext and hypermedia are foundation technologies for multimedia presentations. **Hypertext** is a methodology for the construction and interactive use of text databases. By definition, hypertext contains only text and a limited amount of graphics. **Hypermedia** are electronic documents that contain multiple forms of media, including text, graphics, video, and so on. A hypertext or hypermedia document is a body of text of any size in electronic form that is indexed so that it can be quickly searched by the reader. For example, if you highlight a term on a hypermedia

FIGURE 8.24
What you need to create multimedia productions.



Source: Adapted from Elizabeth Wood, "Multimedia Comes Down to Earth," *Computerworld*, August 1, 1994, p. 71. Copyright 1994 by Computerworld, Inc., Framingham, MA 01701—Reprinted from *Computerworld*.

FIGURE 8.25
A display of a popular hypertext/hypermedia development package, which uses the Hypertext Markup Language (HTML) to develop Hyperlinked documents.



Courtesy of SoftQuad Inc.

document displayed on your computer video screen and press a key, the computer could instantly bring up a display of a passage of text and graphics related to that term. Once you finished viewing that pop-up display, you could return to what you were reading originally, or jump to another part of the document instantly.

Hypertext and hypermedia are developed using specialized programming languages like *Hypertext Markup Language* (HTML), which create *hyperlinks* to other parts of the document, or to other documents and media. Hypertext and hypermedia documents can thus be programmed to let a reader *navigate* through a multimedia database by following a chain of hyperlinks through various documents. The *home pages* on the World Wide Web of the Internet are a popular example of this technology. Thus, the use of hypertext and hypermedia provides an environment for online interactive presentations of multimedia. See Figure 8.25.

Interactive Video

Interactive video is another important multimedia technology that integrates computer and video technologies. Using technologies like digital video interactive (DVI) allows end users to digitally capture, edit, and combine video with text, pictures, and sound into multimedia business and educational presentations. For example, an interactive video session for training airline flight attendants can be produced on CD-ROM disks. It can combine animated graphics displays of different airplane configurations, presentation graphics of airline statistics, lists of major topics and facts, video clips of flight attendants working on various airplanes, and various announcements and sounds helpful in managing emergencies. Figure 8.26 summarizes many of the technologies that are used to create multimedia presentations.

Office Management Systems

Office management systems are an important category of office automation systems. They include electronic calendars, tickler files, electronic mail directories, schedulers, and task management systems. They provide computer-based support

FIGURE 8.26
Technologies for multimedia production and presentation.

Multimedia Technologies

- **Authoring Language.** A high-level computer programming facility with English language commands specifically designed to implement multimedia applications.
- **Compact Disk Interactive.** A multimedia standard proposed by Philips Corp. A specification to read data from a CD containing audio, image, graphics, and computer data.
- **Compressed Audio.** A method of digitally encoding and decoding several seconds of voice-quality audio per single videodisc frame. This increases the storage capability to several hours of audio per videodisc.
- **Computer Edit System.** A video editing system controlled by a computer and interfaced to several playback and record machines. This type of system is capable of making precise frame-accurate edits.
- **Digital Audio.** A technique that stores audio as a series of numbers.
- **Digital Video Interactive.** This technology compresses video images and, in its latest version, can produce animated scenes at 30 frames per second. The current compression ratio is 160-to-1.
- **Interactive Video.** The convergence of video and computer technology. A user has control over a coordinated video program and computer program through the user's actions, choices, and decisions, which affect how the program unfolds.
- **Musical Instrument Digital Interface.** Serial data transmission protocol for transporting musical information between compatible electronic musical devices.
- **Sound Board.** An add-in card with software that captures and plays back sound or music.
- **Storyboard:**
  1. A visualization of the order of a piece, using representative frames from each shot or sequence to show a visual skeleton of the piece.
  2. Documentation for video production that contains the audio script and a complete description of the visual content often in the form of pictures or sketches.
- **Video Capture Card.** An add-in card that digitizes analog video from a VCR, video camera, or still-image camera. Video can be digitized as a single frame or multiple frames per second to produce full-motion video.

Source: Elizabeth Wood, "Multimedia Comes Down to Earth," *Computerworld*, August 1, 1994, p. 70.

services to managers and other office professionals to help them organize their work activities. Office management software computerizes manual methods of planning such as paper calendars, appointment books, directories, file folders, memos, and notes. Microcomputer users can get some of the benefits of office management systems by using *desktop accessory* and *personal information manager* packages. Groupware packages are also available which enable members of work groups on local area networks to share a variety of office services; thus, office management systems can help end users and work groups organize routine office tasks.

For example, you could enter the date and time of a meeting into an electronic calendar. An electronic tickler file will automatically remind you of important events. Electronic schedulers use the electronic calendars of several people to help you schedule meetings and other activities with them. Desktop accessories provide features such as a calculator, notepad, alarm clock, phone directory, and appointment book that pop up in a window on the display screen of your workstation at the touch of a key. Electronic mail directories help you contact people easily. And electronic

FIGURE 8.27
Using an office management system for task management.



Courtesy of IBM Corporation.

task management packages help you plan a series of related activities so that scheduled results are accomplished on time. Figure 8.27 shows the use of an office management system.

Management Implications of Office Automation

Office automation systems help end users achieve the benefits of (1) more cost-effective communications and (2) more *time-effective* communications than traditional written and telephone communications methods. For example, electronic mail and facsimile systems are designed to minimize *information float* and *telephone tag*. **Information float** is the time (at least several days) when a written letter or other document is in transit between the sender and receiver, and thus unavailable for any action or response. **Telephone tag** is the process of (1) repeatedly calling people, (2) finding them unavailable, (3) leaving messages, and (4) finding out later you were unavailable when they finally returned your calls.

Electronic mail, voice mail, and facsimile systems can also eliminate the effects of mail that is lost in transit or phone lines that are frequently busy. They can also reduce the costs of labor, materials, and postage for office communications (from more than $5 for a written message to less than 50 cents for an electronic message is one estimate). Also, the amount of time wasted in regular phone calls can be reduced (by one-third, according to another estimate) [3, 20].

Of course, these advantages are not acquired without some negative effects. First, the cost of automated office hardware is significantly higher than the equipment it replaces. The ease of use and lack of security of many office automation systems have also caused problems. Inefficient and unauthorized use of electronic mail, voice mail, and facsimile services can significantly impair office productivity. One example is sending copies of electronic mail messages to people who do not need or want them. Another is "junk fax"—receiving unauthorized advertisements and unrequested documents that disrupt the normal use of office fax machines. Programs of employee education and policies that stress efficient use of OA services are a natural solution for such problems. Software which monitors and protects against improper use of OA systems is another controversial but fast growing alternative.

Chapter (8)
Office Automation in Small Business

Small businesses play a vital role in our econ-omy, and technological changes could affect that role. Small businesses are often a vehicle for basic innovations; they create new jobs they serve small, local, and specialized markets not otherwise served; and they employ marginal resources that larger companies cannot utilize effectively. This chapter provides some general background and a summary of the limited information currently known about the effects of office automation on small businesses.

The first phase of office automation required relatively large capital investments and much specialized expertise, and was chiefly implemented in large organizations. The availability of small computers and software packages designed for small-scale operation is recent.

Manufacturers and vendors are now emphasizing this market. But very small firms, and in particular beginning entrepreneurs, are often uncertain and apprehensive about taking the first steps toward automating their offices.

They would like to know more about the experience similar small businesses have had with automation, but may find that it is difficult to get objective, disinterested information. Researchers and experts in the Nation's business schools and universities could help to develop a body of information to fill this need. Few researchers have studied the effects on small business. This chapter can provide a starting place for more detailed assessments and discussions.

Purchases of office automation equipment by small businesses are rapidly increasing as the prices of the equipment come down and as this market becomes a major focus of vendors. Computer systems have been used for several years by entrepreneurs and consultants working out of their homes, but the hardware and software used for this purpose were hardly differentiated from that sold for amateur, rec-reational, and educational use in the home market. Now small computers and specially designed software packages are coming into use by very small firms such as farms, restaurants,mom and pop stores, and entrepreneurial sellers of business services, as well as for the larger category of small business, firms with up to 500 employees. They are being used for many applications, including accounting functions, networking with peers, and research.

There have been few or no studies on the impact of office automation technologies on employment, job content, productivity, or survivability of the small business or beginning entrepreneurs. Because of the importance of the small business in the U.S. economy, the extent of adoption of automated office equipment in that sector and the problems faced in implementation of automated systems by small businesses merit special attention.

FACTORS AFFECTING THE USE OF OFFICE AUTOMATION IN SMALL BUSINESSES :

The factors affecting the use of office automation technologies in small businesses center around the price and availability of equipment, the growth needs of the firm, and the available labor or skills. The declining price of microelectronic

equipment is making it more feasible for small businesses to purchase. Access to capital, however, is often still a problem. Even a few thousand dollars in capital investment can be significant. High interest rates limit the ability of very small firms, and especially new businesses, to invest in capital equipment, and the bankers' interest in lending small amounts is minimal. Many small firms simply do not feel the need for omputerization yet, although that situation seems to be changing rapidly.

The targeting of the small business market by manufacturers and retailers has no doubt influenced many to purchase and caused most at least to consider the technologies. The interest of the vendors is evident from the increase in adverfising aimed at small businesses and the number of small business seminars offered by vendors and retail outlets.
The retail computer store has been the most common method or site of purchase because vendors have been unwilling to develop a sales staff to deal with small businesses. Thus, the sales effort has been largely passive. The vendors now are dealing with that problem by means of seminars oriented to small business owners and new entrepreneurs, attracting a target audience with which their sales forces can deal more efficiently.
The dynamics of the firm and of the industry of which it is a member affect a firm's need for and use of automated office equipment. A business that is growing rather than stagnating is likely to use it to service more clients or provide faster response to clients. A growing firm is also more likely to have the capital or credit to purchase new equipment. Struggling firms sometimes expect that office automation will allow them to compete more successfully with larger firms. For example, a small travel agency may find that the addition of a computerized reservation system *is* necessary for it to survive and compete.

Businesses of less than 100 employees make up over 45 percent of the miscellaneous business service industry, and an even larger proportion of another seven industries expected to grow rapidly in the next decade.
The miscellaneous business services, the finance, insurance and real estate industry, and professional services (health and legal), are already heavily impacted by office automation. Personal services, such as beauty shops, drycleaning establishments and repair services are likely to be less affected by office automation. The availability of people to use the equipment will also influence the decision to auto-mate. More highly trained, specialized personnel such as systems analysts and programmers may be needed if the office's activities are in any way highly specialized or nontraditional, and only a few specialized very small businesses are likely to have such people, unless they are themselves the owners/entrepreneurs. the higher cost to the small firm of pension plans and other benefits, the costs of recruiting and hiring these workers, and the small scale of operations and markets put smaller businesses at a disadvantage. Once they have automated their operations, however, they are less likely to be able to employ unskilled neighborhood labor, untrained new or occasional workers, or family employees. The proliferation of incubator facilities that provide computer and elecommunications equipment on a shared basis to small firms or beginning firms will provide many of them with their first opportunist y to use such equipment.

Builders are developing "smart buildings" prewired for computer and ommunications networks, and are renovating older buildings and furnishing them with electronic equipment for lease to small business/entrepreneurs. Such facilities will provide small businesses with the benefits of office automation at an affordable cost The number of incubator facilities in the United States doubled in the last year and shows signs of continued in crease. They are attracting private investment capital as well as private public partnerships and with a two-thirds survival rate for the small businesses using these facilities, appear to be successful.

EXTENT OF OFFICE AUTOMATION IN THE SMALL BUSINESS SECTOR

The lowering of prices has allowed small businesses to begin heavy purchasing of automated office equipment, as evidenced by several marketing studies.Although, more large firms use computers than small ones, small firms are increasing their purchases steadily. Comparison of a 1983 Dun's 5000 survey and a 1985 survey show the increases. (See table 11-1.) The increases in purchases for small firms were 60 to 70 per-cent during this short period. In fact, firms purchased more than twice as many computers during this time as they had predicted they would in the 1983 survey.

Small firms responding to the 1983 survey used their computers mostly for accounting while the largest firms used them for financial analysis and forecasts. By 1985, the use of financial analysis/spreadsheets had decreased overall and the "other category" had increased from 8.5 to 78.0 percent, indicating heavier usage of specialized applications. This confirms the need for specialized software and specialized personnel in the small business if they are to use computerized systems effectively. All of the surveys studied indicated that small businesses are conservative in their choice of systems and the use to which they are put, which is mainly word processing and accounting functions. Larger firms are apt to be more interested in state-of-the-art equipment and more innovative applications than are small firms.

In 1980, Inc. magazine surveyed its readers and found 48 percent of the respondents then using minicomputers and microcomputers or small business computer systems; 22 percent were using word processors.

Only 4 years later, 57 percent owned/leased microcomputers and 28 percent owned/leased minicomputers. The median number of employees of these companies was less than 25. Personal computers are used most often by management, followed closely by engineers, clerical and middle management , e most common use is word processing, followed by accounting/bookkeeping, file/list maintenance, and records/schedules. Further automation of tasks was planned by 72 percent of the respondents within the next 2 years.

The small business market for communications equipment is also increasing rapidly. It was over $3 billion in 1983. The cost of telephone services is high on their list of prob-lems, according to testimony before the Committee on Small Business in 1984.

Small businesses are faced with much more complex choices now in the selection of telephone and other communications services, which intensifies the cost problem.

Table 11.1 .—Percent of Firms Using Personal Computers by Size of Business, 1983 v. 1985

Size of business (number of employees)	1983	1985
1-19	14.50/0	23.90/o
20-99	22.4	36.3
100-499	27,3	47.2
500-999	44.5	71.8
1,000 or more	65.7	85.4
All firms	31.9	46.1

SOURCE Joseph W Duncan, "Dun's 5,000 Survey Shows Dramatic Increase in Use of Personal Computers," Dun & *Bradsfreet Looks* at *Bus/ness*, vol 3, No 3, May/June 1985

Most businesses (66.7 percent) used their computers as stand alone workstations, according to the Dun & Bradstreet 1983 survey. Larger firms were more likely to use personal computers in telecommunications linkups. Very small firms often used their microcomputers to replace a Telex or Twix communications service and were comparatively strong in their use of cmmercial databases.

It is evident from surveys, advertising efforts by vendors, and retail sales activities, that small businesses are purchasing automated office equipment in increasing amounts.

Some are purchasing out of genuine need to improve their productivity and others are purchasing because the competition is doing so.

WHAT ARE THE PROBLEMS?

The very small business is faced with a myriad of problems when considering office automation. Included among these are:

- -Capital-Even though the prices of equipment have decreased tremendously over the past few years, this may still be an expensive undertaking for the very small firm whose access to capital is limited
- -Time—A large investment of time is required to evaluate, purchase, and learn to operate new systems.
- -Expertise–Small businesses often lack the expertise and the financial capability to hire technology experts for evaluation, implementation, and maintenance of automated office systems.
- -Training-Small businesses often lack the time and expertise to train operators of the new equipment. In addition, the cost of training is usually overlooked when planning the purchase of new office technology equipment. The result is neglect of the training function and underutilization of the equipment.
- -Repair services— Equipment is often purchased at retail outlets and the follow up services are not available in a timely manner.
- -Software-Much packaged software is available for small businesses but it may not be entirely suitable to a firm's specific needs.
- -Security–Lack of knowledgc about computer security and little 'control over shared information systems are a problem that the small business will have to deal with in the future as proprietary and private information becomes more accessible to all employees through computerized systems.

Capital

The capital needed to purchase hardware may actually be the lowest cost involved in converting to automated office equipment. Once it is purchased and installed, the owner/manager needs someone to turn to for help when it does not work and the vendor may or may not provide good support. The implementation costs, which include training and temporarily lowered productivity, are often unexpected.

The five U.S. industries that are dominated by small businesses—services; re-tail and wholesale trade; construction; finance; insurance and real estate; and agricultural services have capitalization rates much lower than industries dominated by large businesses. This ratio will have to change if smaller businesses are to automate their offices.

The switch to computers can be a costly and frustrating experience for a small business. Acompany selling cheerleaders supplies leased a computer system that would accept phone in orders, check customer credit limits, figure shipping charges, adjust inventory, print an invoice, add the order to accounts receivable, and update inventory when supplies arrived. Within 6 months, orders were piled up from high schools ready to begin the football season, angry customers canceled orders, and at-torneys general in three States were pressuring the owner to deliver the goods. What had happened? Like many businesses, this company had purchased hardware first and then purchased software from an independent supplier. The owner hired, then fired a computer expert who was unfamiliar with the business operation; neglected to solve poor inventory control problems present before the computer system was implemented; and failed to become involved in the switchover. The owner blamed the equipment vendor and the software supplier and they blamed the business owner. The equipment has been reclaimed by the vendor and the owner is suing them.

Software :

The problems and costs of choosing suitable software are even more significant than those involved in choosing the hardware. Larger firms often have software designed specifically for their use. In these companies, programmers can spend 60 percent of their time doing maintenance on programs.

This is not feasible for the small business manager. Small firms must make do with packaged software that often does not work well for them, and the developer is unavailable to them for consultation, A survey by the U.S. Chamber of Commerce in 1984 found that half of the respondents felt the need for more information than was found in their software manuals, 39 percent found the manuals hard to understand, and 23 percent complained of not having enough written instruction.

General Business Services, a firm that provides consulting services to 50,000 small business clients through franchised counselors, notes that many of the client firms are purchasing microcomputers, but only a small percentage of them are using their equipment fully. The effective use of the equipment depends on the motivation of the users and on improvement and availability of helping aids such as teaching diskettes, trained consultants, and user friendly languages, A small cleaning services firm bought a computer when a 15-year-old bookkeeping

machine broke down. The owner was convinced by a salesperson that a computer would only cost $2,000 more than anew bookkeeping machine. However, he then had to spend $8,000 for customized software. He later learned that the system was too small to track all 6,000 of his customers; two employees trained on the machine never got it working; and a second expert said fixing the system would take an additional $8,000 in programming and equipment.
The owner now stores the computer in an upstairs corner since he could not find a charity to accept it. He is aware of his mistakes-trying to computerize before it was necessary, buying hardware before software, failing to get written guarantees, and failure to plan for training cost. He feels he should have hired a consultant for a second opinion before purchasing the system.

Time

Time is a major problem. An owner/manager with a 50-to 80-hour workweek will find it difficult to invest the extensive time required to investigate office automation equipment and then learn how to operate it. The lack of time to learn the system could quickly cause discouragement.
The equipment is then neither properly nor fully utilized. And he or she often lacks the knowledge needed to evaluate whether automated equipment is really needed. The pressure to be competitive or to purchase because peers are doing so may influence a business owner to buy equipment without the analysis of needs, benefits, and costs that should precede such a purchase.

Training

Training of personnel is another problem faced by the very small business. The manager must not only know how to use automated office equipment, but often must also train employees. Alternatively, he or she must hire trainers or pay for commercial courses; hire new already trained people; or depend on self-teaching software. As the costs of software and training can be twice that of the hardware, this is a significant problem. Salvate's respondents indicated that lack of trained personnel was a problem for them. This may, however, only be a short-term problem, diminishing as existing employees are trained, as more and more new workers are already familiar with computers from school courses, and as there is more and more self-teaching software. At present, however, it is a significant barrier to automation for very small firms.
Bradley Schiller explores the role of small business in training workers and concludes that this may be the most important function of small business. The economy benefits by having a large pool of trained workers available. The advantage to the beginning worker is the opportunity to gain marketable skills, under close supervision, in a variety of activities all of which are generally denied to them in larger businesses. Schiller points out that percent of male workers obtain their first steady job with firms of fewer than 100 employees.
Small businesses now provide a valuable service to the economy and to other businesses by training new entrants to the labor force in specific skills and in general business skills. Only the successful adoption of office automation technologies will enable them to continue this function. However, there are costs to the small business employer. According to Schiller, there is a general exodus of employees from small firms to larger firms (300,000 in the past 9 years), where

they obtain an aver-age of 23 percent in wage increases in the first year. High turnover can be very costly to the small firm. The productivity of new workers is often less than wages paid and the small business may not keep the employee long enough for the increased productivity to pay off.

Security :

As small businesses become more aware that information is a primary resource they will necessarily be more concerned about computer security. Not only could their information be accessed by competitors but it could be distorted or destroyed, deliberately or accidentally, by insiders. The Small Business Computer Crime Prevention Act (S. 1920), which became effective October 1, 1984, provides for educational assistance to small businesses in the area of computer security." Specifically, it provides that the Small Business Administration should, through its extensive network of counselors to small business, provide the computer security education that small businesses lack and may need.

Hearings held in March 1984 emphasized the problems that the small business has with computer security—lack of divisions and specialized employees (one employee could have access to all company information), the high cost of purchasing specialized computer security systems, lack of knowledge/education about the problems, and little control over the information systems used because of leased communication lines, timesharing computers, or packaged software. Even basic security measures such as audit trails are not enforced in many small firms and separating employee duties is difficult.

Leslie Ball, founder of the Association of Computing Machinery's Special Interest Group on Security (SIGSAC), testified to Congress that small business membership and seminar attendance in that group was extremely low, indicating that the growing awareness of the problems of protecting information is not reaching this group.

Vendor Responses

The vendors are aware of the problems faced by the smaller business in adapting to office automation technologies. Available but not fully utilized yet, are systems and components that address these problems, *such as:*
software with a 30-minute learning time; modular systems that can grow with the business; self-diagnostic systems; use of natural languages for easier retrieval of data; customer hotlines for quick, accessible help; and expert systems that simplify managerial tasks.

FUTURE IMPACTS OF OFFICE AUTOMATION ON SMALL BUSINESSES

The impacts of office automation will depend on the overall growth of the economy, the growth stage of the firm, and the growth stage of the industry of which it is a part. It will affect the demand for certain kinds of business services, the extension of their markets, and the employment levels and skills needed.

Small business is a heterogeneous category including very small to medium-size firms, low and high technology firms, professional and unskilled services. Within firms under 100 employees, there may be a very big difference in the effect of

office automation on a three employee owner-managed business and a firm of 50 employees. Some jobs are similar such as that of a secretary, and some functions are similar such as payroll. But compared to larger businesses, small firms have less uniformity by occupation and more multifunction personnel.

Some small business firms, both high and low technology, are dynamic and growth oriented. Some are not. The difference may depend on entrepreneurship, location, and demographics more than on technology. However, the use of available technologies will eventually affect their competitiveness. The Market for Business Services Fortythree percent of small businesses are involved in providing services to other businesses.

The use of office automation equipment will allow firms to perform services such as graphics, printing, and forms generation in-house. Electronic publishing systems can cut printing and documentation costs by up to 50 percent. These trends could decrease the demand for these services from small businesses .29

On the other hand, office automation technologies could also facilitate the entrance of small businesses into national and international markets.

Productivity Most businesses that have automated office functions feel that they have become more productive, often by decreasing time spent on word processing. Small professional offices may gain productivity y by adding clerical chores to the professional job, thereby eliminating clerical jobs. Examples of this include legal offices that use a computerized database from which the lawyer can develop simple wills and other legal papers without benefit of clerical help, and small advertising firms that can computerize all client presentation formats, allowing professionals to compose these without clerical help. Conceivably, professional firms could also go in the opposite direction, having the clerical help develop the basic computerized will or presentation, allowing the professional to spend more time on exceptional work.

Nonprofessional offices may find greater productivity in upgrading clerical skills to include some management functions, such as in-formation gathering and organizing, in order to decrease the need for professionals. The small farmer, though reluctant to switch to computers, is finding that the use of computers will aid in generating the cash flow statements and business plans that banks are now demanding.

The use of a microcomputer for administrative information processing such as accounting/ billing forces the manager to develop more organized work habits that will improve efficiency and lower recordkeeping costs. It could also increase effectiveness by permitting more communication with customers and potential customers and a faster response time to customers needs without a comparable increase in the time and labor required. Income taxes and other Federal paperwork that require a great deal of time could be accomplished with much less stress and time with the aid of a computerized system.

Loss of control of information is a significant problem for the growing business; the use of a computer can alleviate this by allowing the owner/manager to control all records.

Effective use of the equipment purchased will depend on the motivation of the users and on improvement and availability of helping aids such as teaching diskettes and of trained consultants. However, in the effort to minimize costs, the use of trained consultants is most likely to be deferred or eliminated thus reducing the effectiveness of the automation.

POLICY OPTIONS

The public interest in the health of small business is well established; a strong small business sector prevents overconcentration of economic power and wealth and provides opportunity for the exercise of initiative, innovativeness, independence, and challenge to obsolete industries and firms. Small businesses have also played a major economic role in job creation; training and testing of new workers; serving small, specialized, or dispersed mar-kets; and productively utilizing resources that would otherwise be wasted. As small firms are faced with technological change that may bring about structural changes in their economic environment, the related public policy questions are:

- Will office automation make larger firms more efficient and allow them to participate in small and dispersed markets, putting small business at a further disadvantage?

Or can small businesses also use office automation to become more productive and increasingly able to compete with larger firms, in local or in larger markets? To the extent that small businesses adopt office automation, will their important role in creation of new jobs diminish?

If small businesses do not adopt office automation, will the economic and social benefit that they have provided by training new workers be diminished? Only if they remain productive and competitive can small businesses continue to create new jobs, train first-time employees, serve specialized markets, and utilize marginal resources. In the future, this is likely to require them to participate in economy-wide changes in basic technologies-viable small businesses that did not adopt the telephone, the type-writer, electric lighting, and motor vehicles would be difficult to find. Thus, small businesses sooner or later will have to use computers and probably some other office automation. Congress may therefore wish to consider actions to encourage and assist small businesses with efforts to automate. These actions need not involve major programs or large expenditures since they would be directed only at reducing the problems encountered by very small or beginning firms that have themselves made the decision and taken steps toward improving their productivity. Congress might, for example, urge the Small Business Administration to expand its instructional and counseling services to small entrepreneurs who are considering the use of office automation equipment for the first time. SBA could also provide initial training for employees of very small firms at low cost, or provide a telephone advice and information service to supplement the often inadequate support services available to small computer users through computer stores and vendors. It could provide incentives for banks to provide small low-interest loans for the purchase of computers, software, and maintenance and support.

Chapter (9)

VIRTUAL OFFICE INTRODUCTION

All the components of your physical office can be mirrored, supported, or enhanced by a virtual office. General information is available to all, but clients can access informational services, review their personal plans, and update their files. They can even pose questions or pick up customized information that you leave for them, all at their convenience.

The Virtual Office Concept :

Cut operating costs in <u>your business</u> by tens of thousands a year, focus on your core business, hire remote staff, but best of all, you can...

- Work from home on your desktop that is at the office.
- Hire low-cost labor in small towns a hundred miles away.
- Read information in your office filing cabinets from your house.
- Outsource your bookkeeping and have 100% access to the data files.
- Need to meet with clients? Have them log onto your computer - you both see their spreadsheets and forms. No more travel time - work in your housecoat.
- Hate paying technicians to keep your network running? Get rid of it.

What types of small business does this work for?

- Accounting, Tax, and Billing Service Firms
- Legal Offices
- Real Estate Sales
- Financial Services Offices
- Insurance Offices, Adjusters, and etc.
- Large Ticket Sales Firms - of almost any type
- Internet Website Development Companies
- Computer Service and Installation Firms
- Advertising Firms
- Collection Firms
- Employment & Human Services
- Travel Agencies
- Construction Companies
- Consumer Service Companies - like furnace cleaning
- Telephone Interconnect Companies
- Almost ALL Business Service Companies

Elements of a Successful Virtual Office :

- **Connectivity.** Clients can easily locate it, enter, and find value. Connectivity consists of speed (bandwidth) and accessibility (computer or other Internet access device). Dial up connections vary from free to $20 per month, while DSL, and broadband cable range from $39 - $79 a month. ISDN or satellite options may also be a consideration.

The fastest and most expensive solution is T-1 line or frame relay (partial T-1) that can vary from $300 to $1,000 per month.

- **Content.** The most useful information is targeted to the visitor and delivered at the right time. The key is customizing the content based on what you know about the visitor, or on what they have selected. This makes your virtual office more valuable, easier to use, and increases the chances that they will return often.
- **Communication.** Relationships are built through one-to-one communication. Visitors to your virtual office must be able to request personal contact easily and must get quick and full responses.
- **Collaboration.** Advising begins with gathering client information that is augmented by your knowledge and wisdom. A virtual office can provide a place to share information, as well as a space (the computer screen) where you and a client can look at the same presentation materials while carrying on a conversation.
- **Community.** As clients become comfortable with your virtual office, they more freely share information and feedback. Your virtual office becomes their personal financial community.
- **Commerce.** Your clients want products and solutions, in addition to advice and oversight. Clients might want online trading, banking, lending, investments, and insurance. Understandably, neither you nor your Broker Dealer is quite ready to take on the fiduciary responsibility, business risk, or expense to provide a "one stop shop". You can still provide access to these products by linking your site to other product and service providers that you feel are not competitive.
- **Compliance.** All communications with the public are subject to compliance with the NASD Conduct Rules. Electronic communications may be considered correspondence, public forums, advertisements, or sales literature. It is important to understand the legalities of your virtual office and communications. The Internet is a means of communication that can enhance your objectives; but it also opens the door to competition. To fight back, we can offer a "virtual office" where clients and prospects enjoy the high-tech convenience of the Internet, combined with our high-touch professional service.

VIRTUAL OFFICE BENEFITS:

1. Virtual Office is Very Simple to Setup and Maintain:

- Complete Outsource Turn-Key Solution
- Complete Setup within 2 business days
- No Equipment To Purchase or Maintain
- No Software to Purchase or Maintain
- Easy Remote Administration
- Very Small Setup Fees
- Very Small Monthly Fees

2. Virtual Office Gives You Complete Control: Virtual Office allows you full control over your inbound calls with the ability to accept or reject the calls before answering them. An Auto-Attendant notifies you when a message is left by e-mail, pager or voice call. Calls may also be transferred or triggered for notification based on your defined schedule. If you don't want to take a call you can send the call to an alternate extension or voicemail box.

3. Virtual Office Maximizes Your Productivity: Virtual Office is much more than simply a bundle of diverse capabilities. It actually redefines business communications with an unprecedented level of flexibility and integration that maximizes productivity gains and customer satisfaction. VoiceStamps Virtual Office gives you the power to decide when and where you want to receive your calls.

4. Virtual Office is the Wave of the Future: In the past, for a business to have this level of telephone sophistication... it usually required an intelligent phone system, voicemail, and auto attendant equipment in-house with many phone lines installed. You could easily spend as much as $20,000 for a very basic in-house solution.

5. Virtual Office Gives You a Corporate Presence: We can make your business appear as if it as a solid corporate business with many different departments, even if you are a SOHO or home-based business. A Virtual Office helps you take your business to the next level and adds more credibility to your business. As your company grows we will grow with you, meeting all your messaging needs.

6. Virtual Office Offers Incredible Mobility: If you need to move locations or leave the office, just forward your phones into your new location. Many of our clients will forward their important calls to their mobile phone so they don't miss a beat.

7. Virtual Office Gives You a Permanent Number: With Virtual Office you'll never have to worry about notifying your clients of number changes. No hassles, no number change headaches, no downtime.

8. Virtual Office Saves Your Business Money:
Now you can outsource your entire phone system for a small monthly fee and save a bundle. No hardware to purchase, no software to purchase, and no systems to maintain. In addition, with our screened transfers you can run multiple business over the same phones and phone lines for a significant cost savings. For example, we have a client who has 5 virtual offices all pointing to their home office. They actually run 5 completely independent businesses out of the same location, with the same phones, and the same analog phone lines. VoiceStamps was able to cut their phone costs by 80%.**Virtual Office Drastically Cuts Costs:** by eliminating the need for a variety of expensive proprietary devices and systems, including:

•Proprietary PBX's or Private Phone Systems
•Automatic Call Distributors
•Help Desk Servers
•Interactive Voice Response Servers
•Call Recording and Logging Systems
•Voice-Mail Servers
•Fax Servers
•Unified Messaging Servers
•Web-Servers

•E-mail Servers
•Web-Mail Servers
•Web-Callback Servers
•Internet and Modem Access Servers
•Digital Phone Lines or PRI
•Firewall Servers
•CTI Gateways
•Credit Card Processing Gateways
•ACH Check Processing Gateways
•Campaign Scripting Utilities
•Voice Recording Software
•Voice Recording Talent
•Call Accounting Systems
Plus the very expensive optional modules that further extend system capabilities may include:
•Predictive Dialing
•Speech Recognition
•Text to Speech
•Voice Print Analysis
•VoIP
•Voice over Web
•VPN and Security Firewalls
•Site and Certificate Servers
All of these individual Virtual Office technologies would cost you anywhere from $150,000 to $200,000 and at least 6 months to implement yourself. Save yourself time and money and catch the wave of the **VoiceStamps Virtual Office.**

SYSTEM OVERVIEW:

•Customized menu trees; no limit on menu selections.
•3 types of Call Transfers
•3 types of Message Notifications
•Question and answer audio surveys.
•Dial-by-letter Name Directories
•Update outgoing messages/greeting remotely.
•Greetings played according to time of day.
•Direct-connect to a live person at any local or 800 #.
•Detailed monthly reports.
•Specialized message-taking ability.
•Fax On Demand.

SYSTEM FEATURES:

With Voice Stamps Virtual Office you can transfer callers to any local or 800 telephone number. You have the power and the convenience of a full scale Call-Processing system at a fraction of the cost. More importantly, you can have the image and impressive sound of a large corporation without the expense.

Voicemail Box - Plays greeting, takes a message, transfers call, triggers notification.
Menu Option - Plays greeting, receives touch-tone input, routes call based on input or other criteria such as call number or time of day. These can be linked together in a "menu-tree" to give multiple options for various departments.

Three Types of Call Transfers:

1. Blind Transfers - Transfers caller to the specified telephone number and releases the call. Soon as you pick up the line...the caller is instantly on the line.
2. Monitored Transfers - Waits to see if the transferred call is answered or if the line is busy. If busy or no answer, caller is returned to the mailbox greeting and allowed to leave a message or make another choice. When you answer the phone you will hear "I have a call for you" then after a 1 second pause you can start talking.
3. Screened Transfers - Same as monitored transfer but announced to the person answering the phone what the call is about with a pre-recorded call tag. When you answer the phone you will hear "I have a call for....CALL TAG HERE.... to take the call press 1 to send to voicemail press 2.

Three Types of Message Notifications:

1. E-mail Notification - Your voicemail is automatically delivered to your specified email address. This allows you to easily store and track all your voicemails electronically.
2. Pager Notification - The mailbox number is sent to the pager alerting the owner of a message waiting. This can be scheduled.
3. Voice Call Notification - The mailbox dials a specified telephone number and plays a message asking the owner of the mailbox to enter a pass code for immediate access to messages. This feature can dial up to 5 different numbers and/or pagers at various times and intervals. With all these features, you can design a Virtual Office that exactly meets your requirements. Whether a retail store trying to manage call flow, a sales group always on the road or a new business with an image to project, the Virtual Office is versatile and cost-effective.

VIRTUAL OFFICE FEATURES:

•Live Call Transfer to DFW or 800 numbers
•Scheduling for Transfer and Message Notify
•Message Forwarding
•5 Personal Group Distribution Lists
•Receipts and Confidential Messages
•Multiple Mailbox Greetings (3)
•Pause, Rewind, Fast Forward,
•Future Delivery, Make, Answer,
•Forward With/Without comment, Save As New
•Volume adjust
•Auto Time/Date Stamp

•Standard Voicemail - up to 2 minutes, 7 days old, 3 new
•Gold Voicemail - up to 4 minutes, 14 days old, 6 new
•Platinum Voicemail - up to 8 minutes, 28 days old, 12 new
•800 Service is a Free Add-on ($10.9 cents per minute)

VIRTUAL OFFICE PARAMETERS:

Options: each Virtual Office comes with a set number of options, once you run out of options we can bump you up to the next level of Virtual Office.
Voicemail Boxes: Standard Voicemail Boxes come with 2 minutes of record time, 7 days new message storage and 3 days old message storage.
Voicemail Box Upgrades: Voicemail Boxes may be upgrade from Standard to Gold or Platinum for heavy users.
Each upgrade doubles the message size, and doubles the storage times.
Direct Inbound Dial (DID) Numbers:We will give you your own dedicated DID number in with your Virtual Office.
You may add additional DID numbers if you want separate front ends or additional inbound dial numbers for private
extensions to ring direct.
Call Volume: The Virtual Small Office supports up to 3500 calls per month and the Virtual Office 1,2,&3 supports 5000 calls per month. Each call is $.02 cents each after call volume limit is exceeded. You will receive a monthly call detail report with each Virtual Office Package showing your call volume for each box and for your overall Virtual Office.

VIRTUAL OFFICE OPTIONS:
•Main Inbound Menu = 1 option
•Options Menu = 1 option
•Fax on Demand Menu = 1 option
•Name Directory = 1 option
•Fax Document = 1 option
•Direct Inbound Dial Number (DID) = 1 option
•Standard Voicemail Box = 1 option
•Gold Voicemail Box = 2 options
•Platinum Voicemail Box = 3 options

What is the technology we use? You will see how we ecided what to buy, how to set it up, and how to use ...

- Multiple offices on the same software programs from anywhere - all for as little as $100 per month
- White board connections from our DSL provider so we can work together on projects
- Order-entry - done 24 hours a day from anywhere in the world - we outsource 25,000 orders a year
- AuthorizeNet - how we collect checks & credit cards and how orders print at the outsource warehouse
- QuickBooks Accounting software linked to our off-site order-entry, via the web

- The remote office that allows us to hire low-cost help in far away places
- Paperless office technology with the Internet - our filing cabinets are on the web so we can all read them
- The ability to publish your clients' tax returns and financials to a web site to improve customer service

Virtual office concept reduces overhead cost by over 25%

Over the last few years a new trend in work style has eliminated the need for many to commute to the office daily. Initially this concept was seen only as being applicable in the "outside" sales force of many companies. This trend is now showing up in many other functions within organizations. The result has been that less office space is required to run many businesses on a day to day basis.

From our first hand experience, we have seen our office space requirement drop by over 25%. In one confidential internal report of a Fortune 10 corporation they estimate that they can have up to 40% of their staff work at home in a virtual office. That study calculates that there will only be a need for a common area that has one office space for every six virtual office employees.

In our case we were able to take one of our consulting and administrative offices from 5,000 to 3,500 square feet of space while increasing the usability of the office. Many larger companies such as AT & T, NCR, and Kodak have found this same percentage applies to 100,000 square ft. offices. One of our clients has a large programming pool and they have applied this to their staff in Southern California and it seems to work very well.

All of this comes with some cost and change in the culture of an organization. In talking with a number of individuals who work out of a virtual office in their homes we have found a number of very interesting things:

1. If someone is going to work hard in the office they can and often work harder out of a virtual office. There is some new discipline that must be learned but it is not impossible. One of the techniques that many people follow is to dress as if they are going to the office.
2. Most people will devote more productive time to their work if they work out of their home. Commuting hours are modified to minimize the amount of time that is wasted sitting in rush hour traffic. In addition, when there is nothing else to do, many will drift towards the in-home office and spend some time working late at night.
3. Communication and trust become critical. In order for the concept to work there must be a way to contact everyone quickly and effectively. In addition, management must believe that the employees have the best interest of the enterprise in mind and are working to met the group's common goals.
4. More time is spent with the customer/client. People working in this environment "bond" more closely with the people that they are dealing with on a day to day basis. As long as there are guidelines and rules this can be a very strong positive for everyone.

Requirements to support a virtual office cost between $3,500 to $4,500 per employee

There are both enterprise wide and individual specific requirements necessary to support virtual office employees. Included within the enterprise wide requirements are voice mail, a data communications network, and office equipment in the virtual office.

Voice Mail

No matter what system is used it is mandatory for the people on the voice mail system to check their mail frequently and return all calls. We have had a number of cases in our firm where messages have been exchanged via voice mail systems and tasks completed without any communication other than voice mail systems. Please note this does not work with an unhappy customer.

The Voice Mail system should be both user friendly and feature rich. There needs to be the capability to reach a person through the system without getting lost in voice mail hell. One feature that we have found to be the most helpful is that the system will call out to say there is a voice mail message on the system for an individual. In my case if I am driving, the voice mail calls my car phone. If I am there, I can take the message right away. If I am not the next time that I call into the office, I can get the message.

The system needs to have the ability to transfer to someone other than the person called. An on-line telephone directory is a great help.

Data Communications Network

As people need information it must be available to them from remote locations. This means there should be a network that is accessible from the outside. This brings up a whole set of security issues that need to be addressed. For example, one Fortune 10 company had its network invaded by someone who acquired the access codes via a cellular phone scanner.

Office Equipment in the Virtual Office

Each of these offices need to have a phone line and possibly a printer. In addition, each individual working under this concept should have a PC (laptop preferred) that they can use for E-Mail and normal administrative functions. This PC will be the office support staff for the employee when they are out of the office.

Summary

We have used a virtual office concept for over six years. We have had both consultants and administrative staff that have worked in a virtual office. In general, we are very pleased with this approach to doing business. Our firm would not have been able to prosper the last few years without the inherent savings that we have attained from this implementation. We have a number of additional pieces of technology that we are currently implementing to expand this concept. Included are a network based fax system and a firm/customer bulletin board system to foster better communications.

Over the next few years this is where the action is going to be. It is too expensive to have stand-alone offices with larger overhead to do much of the work that can be done by single individuals. Back to the cottage approach to work.

Chapter (10)

Office Automation & Telecommunications

The purpose of telecommunications is to convert information from one location to another.

- Data : Precise communication
- Voice : More convenient to convey information, that's why voice communication has predominated for over a century
-

Why Telecommunications is important

Empower a business with a network that spans every location, and that organization can operate more efficiently and more creatively. By electronically linking workers, a network enables all employees to work together as efficiently as if they were in the same work group. A network allows people to make decisions based on the most current information; they don't have to rely on a report that was generated yesterday. This leads to better decisions and higher productivity. Propelled by the right corporate philosophy, an enterprisewide network can help even a monolithic corporation act like an agile start-up company [17].

End users need to communicate electronically to succeed in today's global information society. Managers, end users, and their organizations need to electronically exchange data and information with other end users, customers, suppliers, and other organizations. Only through the use of telecommunications can they perform their work activities, manage organizational resources, and compete successfully in today's fast-changing global economy. Thus, many organizations today could not survive without interconnected *networks* of computers to service the information processing and communications needs of their end users. As a managerial end user, you will thus be expected to make or participate in decisions regarding a great variety of telecommunications options. That's why we need to study the applications, technology, and managerial implications of telecommunications.

Understanding Telecommunications :

Definition

- **Telecommunications :**

Telecommunications is the sending of information in any form (e.g., voice, data, text, and images) from one place to another using electronic or light-emitting media. *Data communications* is a more specific term that describes the transmitting and receiving of data over communication links between one or more computer systems and a variety of input/output terminals. The terms *teleprocessing, telematics,* and *telephony* may also be used since they reflect the integration of computer-based information processing with telecommunications and telephone technologies. However, all forms of telecommunications now rely heavily on computers and computerized devices. For this reason, the broader term *telecommunications* can be used as a synonym for data communications activities. Therefore, in this text, we will use these terms interchangeably.

Typical Communication System







Input Transducer
Encoder
Modulator
Amplifier

Air, Free Space
Copper Cable
Optical Fiber



- Transducer : transform one form of Energy into another eg. Sound Electrical
- Transmitter : amplifies and processes the electrical replica of message for transmission
- Receiver : amplifies and processes the received elctrical signal in reverse manner to recover the original message
- Transmission Channel : a path connecting Transmitter [Tx] to Receiver [Rx]. which is characterized by attenuation

Thus :

- Telecommunication - the sending of information in any form from one place to another electronically
- The telecommunication system has become as important to the movement of information in organisations and society as the highway system is to the movement of people and physical goods
- Telecommunications management deals with the integrated use of total communications capacity
- Examples are: voice, data, messages, fax, computers, video conferencing, security. business television, factory automation etc.

Applications of Telecommunications :

Telecommunications networks provide invaluable capabilities to an organization and its end users. For example, some networks enable work groups to communicate electronically and share hardware, software, and data resources. Other networks let a company process sales transactions immediately from many remote locations, exchange business documents electronically with its customers and suppliers, or remotely monitor and control production processes. Telecommunications networks can also interconnect the computer systems of a business so their computing power can be shared by end users throughout an enterprise. And, of course, telecommunications networks enhance collaboration and communication among individuals both inside and outside an organization.

Figure 6.2 emphasizes the many possible applications of telecommunications. It groups a large number of telecommunications applications into the major categories of electronic communications systems, electronic meeting systems, and business process systems. Also note that these applications can be supported by several major types of telecommunications architectures.

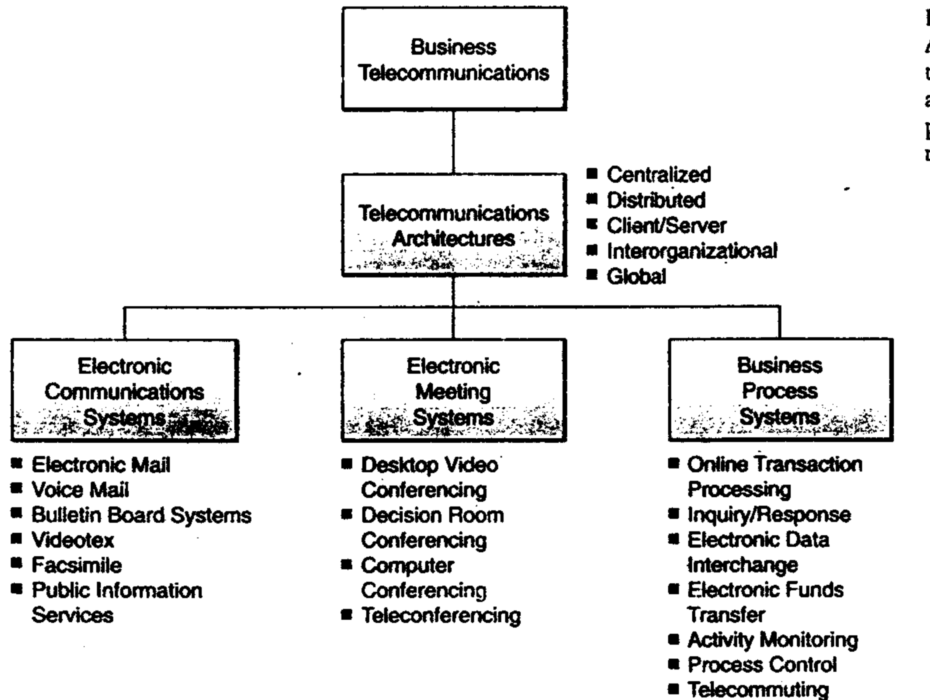


FIGURE 6.2
Applications of telecommunications. Note the major categories and types of applications supported by telecommunications networks.

Teleconferencing is the use of electronic transmission to permit two or more people to "meet" and discuss an idea or issue. The term *teleconferencing* normally applies to options including audio conferencing, audiographic conferencing, and video conferencing.

Audio conferencing is a single telephone call involving three or more people participating from at least two locations.

Audiographic conferencing is an extension of audio conferencing permitting dispersed participants to see pictures or graphical material at the same time.

Video conferencing is a form of teleconferencing in which the participants can see the distant participants.

Messaging Systems

Electronic technologies including electronic mail, voice mail, and fax became popular in the 1980s to make different-time/different-place communication more effective. Each of these technologies sends documents or messages from one location to another.

Electronic mail (e-mail) is the use of computers to send and retrieve text messages or documents addressed to individual people or locations. There have been many innovative uses of e-mail to improve communication. People in large organizations have used it to bypass bureaucratic structures. Some organizations have eliminated many formal memos by using e-mail and getting directly to the point. E-mail has also been used as a communication tool for people who are not fluent in the language in which business is conducted. E-mail removes accents and permits nonfluent speakers to read a message several times that otherwise might be misunderstood in a phone conversation. Although e-mail has many advantages and potential uses, it does have the major disadvantage of being a computerized text (or text plus image) file. Messages in this form are useful, but the most natural form of communication for most people remains the human voice, not electronic files.

Voice mail (v-mail) is a computerized method for storing and forwarding messages that are spoken rather than typed. V-mail systems combine the voice recording feature of telephone answering machines with the editing and forwarding concepts of e-mail systems. V-mail systems record voice messages on a direct access device. V-mail is typically used to automate message taking by telephone attendants. The recipient retrieves messages by calling in to the v-mail system and entering an identification code using a touchtone telephone. This telephone can be anywhere, making v-mail more practical than e-mail for sending and receiving brief messages in most situations.

V-mail has several advantages over e-mail. The most important is that telephones are much more commonly available than computers linked to networks. V-mail can be installed in an organization that makes minimal use of computers. Another advantage is that v-mail can convey more emotion and social context than e-mail. E-mail is much better than v-mail systems for conveying details and complex technical information, whereas v-mail is effective for short, non-technical messages.

Fax is a third electronic form of different-time/different-place communication. It is the transmission of a picture of a page to create a facsimile of the page at a different location. A fax machine scans a piece of paper, digitizes its image, and then transmits this image to another location, where it is printed or stored on a computer for later use.

Issues Related to E-mail, V-mail, and Fax
As with any technology, e-mail, v-mail, and fax all have both strengths and weaknesses, some of which limit their effectiveness and generate unanticipated consequences.
Social context: E-mail, v-mail, and fax all filter out some of the social context. Ideas communicated using these tools may seem less forceful or caring compared to the same ideas communicated personally. These tools should be used only when social presence is unimportant for understanding the message.
Danger of misinterpretation: The meaning of speech is conveyed partly in the inflection of a voice. E-mail and fax provide no clue about inflection, and v-mail filters out body language.
Power relationships: Use of e-mail and v-mail may create new communication patterns, sometimes involving people who have never communicated previously. With these tools, high-level managers find it easy to obtain information directly from people lower in the organization without going through intermediate managers and chains of command.

Privacy and confidentiality: Confidentiality problems may arise because fax outputs can be read by whoever is near the machine, which is often in a clerical work area.

Electronic junk mail: All three technologies can distribute messages that waste the recipient's time. Junk faxes may tie up fax machines when important faxes should be arriving or use up all the paper in the machine. Some states have considered legislation against junk faxes. However, companies sending these faxes argue that prohibiting this practice would violate their right to free speech.

Information overload: Common use of e-mail, v-mail, and fax means that people receive more information faster than they ever did before. Some complain that e-mail, v-mail, and fax have generated higher workloads, more stress, and an inability to get away from work.

Groupware is a relatively new and still somewhat unshaped category of systems that help groups and teams work together by sharing information and by controlling work flows within a group. Products considered groupware are still new enough that their long-term direction is unclear. Many groupware products are related to specific group-related tasks such as project management, scheduling meetings, and retrieving data from shared databases.
Other groupware functions can be performed through **computer conferencing**, which is the exchange of text messages typed into computers from various locations to discuss a particular issue. When this is done through the Internet, it is sometimes referred to as a **newsgroup**.

Intranets and Extranets

The information sharing concepts of groupware can be applied on a larger scale using the technology of the Web. Intranets and Extranets are an additional type of communication system. **Intranets** are private communications networks that use the same interface as the Web but are restricted to the computers on the private network. **Extranets** are private networks that operate similarly to Intranets but are directed at customers rather than at employees. In practice, this means that Extranets are directed at any group that can benefit from a single source of information that is shared.

Building the Telecommunication Highway System :

The trend toward open, high-speed, digital networks with fiber optic and satellite links has made the concept of an **information superhighway** technically possible, and has captured the interest of both business and government. In this concept, local, regional, nationwide, and global networks will be integrated into a vast "network of networks." The information superhighway system would connect individuals, households, businesses, government agencies, libraries, universities, and all other institutions and would support interactive voice, data, video, and multimedia communications. See Figure 6.4.

As championed by then Senator and now Vice President Albert Gore, the information superhighway could provide a National Information Infrastructure (NII) and economic network that would be the equivalent in its economic impact of the transcontinental railway and interstate highway systems combined. Critics question whether the potential benefits of the superhighway would be worth its cost [6]. The proposed national data highway system would be a massive undertaking, costing hundreds of billions of dollars and taking several decades to construct. For a example, government estimates of the investment cost include investment by private industry of $2 trillion, with the government investing $200 billion over 10–50 years [5].

Why build such a superhighway network? Proponents argue that the information superhighway (or *infobahn*) would create a national information infrastructure that would dramatically increase business efficiency and competitiveness by improving economic communications, collaboration, and information gathering. For example, the information superhighway could use electronic mail, videoconferencing,

:URE 6.4
·rview of the information
·ɑhighway.

- **Names:** Information superhighway, national data highway, infobahn, national information infrastructure.
- **Purpose:** Create a national telecommunications infrastructure of interconnected local, regional, and global networks to support all economic, societal, and individual telecommunications.
- **Participants:** All individuals, households, businesses, government agencies, libraries, schools, universities, and other institutions.
- **Communications:** Interactive voice, video, data, and multimedia telecommunications.
- **Examples:** Universal electronic mail, video conferencing, electronic data interchange, interactive home shopping, education, entertainment, and all forms of online, realtime computing.
- **Builders:** Private industry (telecommunications companies, entertainment companies, publishing companies, etc.) and the federal government.
- **Cost and time estimates:** From hundreds of billions to several trillions of dollars, over 10 to 50 years.

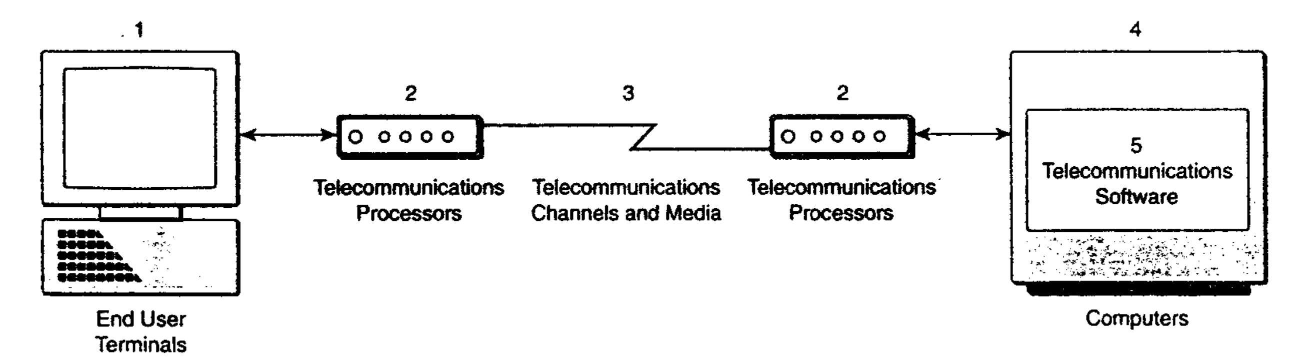
and electronic databank services to enable businesses throughout the country to build products faster through an electronic collaboration in the product design process. Or the highway could support an interactive video home shopping and entertainment system that could revolutionize the retailing and entertainment industries [5]. In any event, the information superhighway promises to have a major impact on developments in telecommunications and on our nation's economic and social life in the years to come.

A Telecommunications Network Model

Before we discuss the use and management of telecommunications, we should understand the basic components of a *telecommunications* network. Generally, a *communications network* is any arrangement where a *sender* transmits a *message* to a *receiver* over a *channel* consisting of some type of *medium*. Figure 6.5 illustrates a simple conceptual model of a **telecommunications network**, which shows that it consists of five basic categories of components:

- **Terminals**, such as networked microcomputer workstations or video terminals. Of course, any input/output device that uses telecommunications networks to transmit or receive data is a terminal, including telephones, office equipment, and the *transaction terminals* discussed in Chapter 4.
- **Telecommunications processors**, which support data transmission and reception between terminals and computers. These devices, such as *modems* and *front-end processors*, perform a variety of control and support functions in a telecommunications network. For example, they convert data from digital to analog and back, code and decode data, and control the accuracy and efficiency of the communications flow between computers and terminals in a telecommunications network.
- **Telecommunications channels and media** over which data are transmitted and received. Telecommunications *channels* use combinations of *media*, such as copper wires, coaxial cables, fiber optic cables, microwave systems, and communications satellites, to interconnect the other components of a telecommunications network.

FIGURE 6.5
The five basic components in a telecommunications network: (1) terminals, (2) telecommunications processors, (3) telecommunications channels and media, (4) computers, and (5) telecommunications software.



- **Computers** of all sizes and types are interconnected by telecommunications networks so that they can carry out their information processing assignments. For example, a mainframe computer may serve as a *host computer* for a large network, assisted by a minicomputer serving as a *front-end processor*, while a microcomputer may act as a *network server* for a small network of microcomputer workstations.
- **Telecommunications control software** consists of programs that control telecommunications activities and manage the functions of telecommunications networks. Examples include *telecommunications monitors* for mainframe host computers, *network operating systems* for microcomputer network servers, and *communications packages* for microcomputers.

No matter how large and complex real-world telecommunications networks may appear to be, these five basic categories of components must be at work to support an organization's telecommunications activities. This framework can thus be used to help you understand the various types of telecommunications networks in use today.

Types of Telecommunications Networks

There are many different types of telecommunications networks. However, from an end user's point of view, there are two basic types: *wide area* and *local area* networks.

Wide Area Networks

Telecommunications networks covering a large geographic area are called *remote networks, long-distance networks*, or, more popularly, **wide area networks** (WANs). Networks that cover a large city or metropolitan area (*metropolitan area networks*) can also be included in this category. Such large networks have become a necessity for carrying out the day-to-day activities of many business and government organizations and their end users. Thus, WANs are used by manufacturing firms, banks, retailers, distributors, transportation companies, and government agencies to transmit and receive information among their employees, customers, suppliers, and other organizations across cities, regions, countries, or the world. Figure 6.6 illustrates an example of a global wide area network for a major multinational corporation.

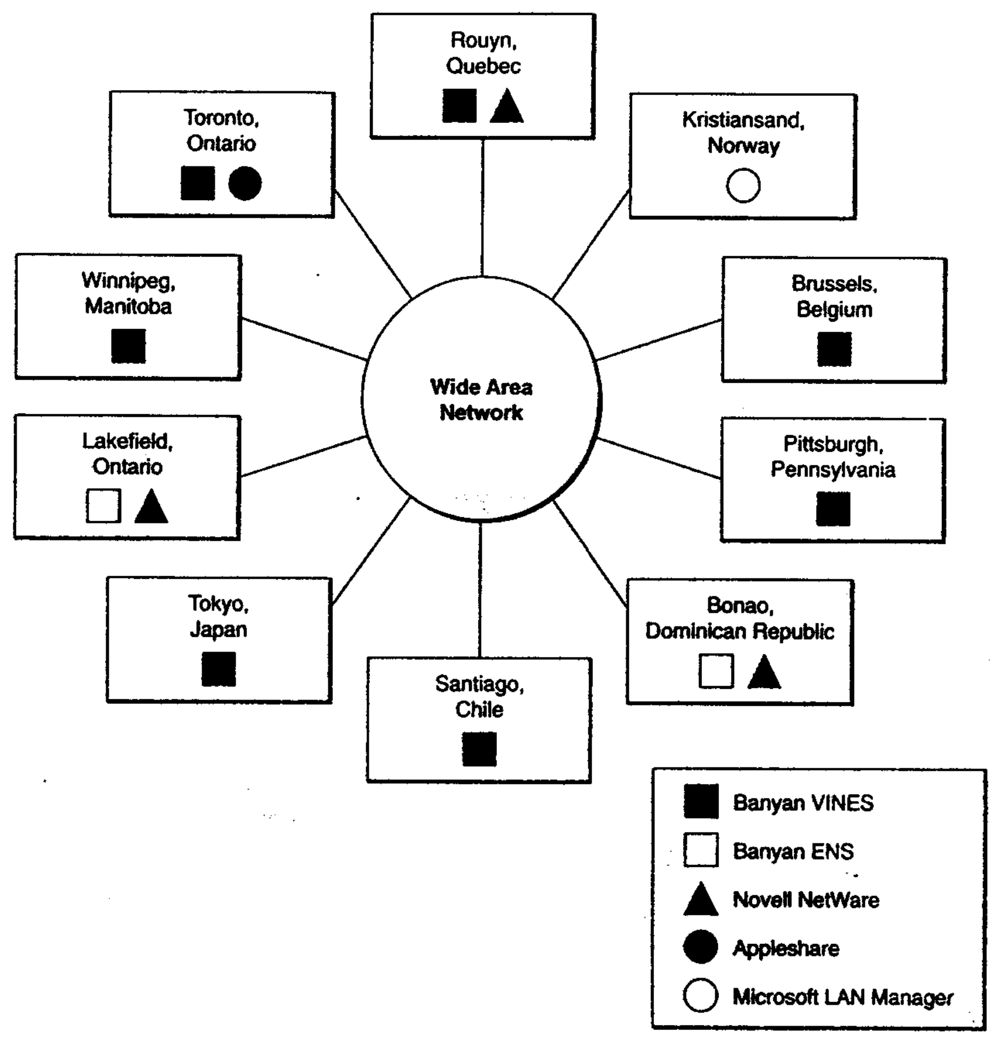
Local Area Networks

Local area networks (LANs) connect computers and other information processing devices within a limited physical area, such as an office, a building, manufacturing plant, or other work site. LANs have become commonplace in many organizations for providing telecommunications network capabilities that link end users in offices, departments, and other work groups.

LANs use a variety of telecommunications media, such as ordinary telephone wiring, coaxial cable, or even wireless radio systems to interconnect microcomputer workstations and computer peripherals. To communicate over the network, each PC must have a circuit board installed called a *network interface card*. Most LANs use a powerful microcomputer having a large hard disk capacity, called a *file server* or **network server**, that contains a **network operating system** program that controls telecommunications and the use of network resources. For example, it distributes copies of common data files and software packages to the other microcomputers in the network and controls access to laser printers and other network peripherals. See Figure 6.7.

LANs allow end users in a work group to communicate electronically; share hardware, software, and data resources; and pool their efforts when working on

FIGURE 6.6
The wide area network (WAN) of Falconbridge Limited interconnects a variety of local area networks (LANs).



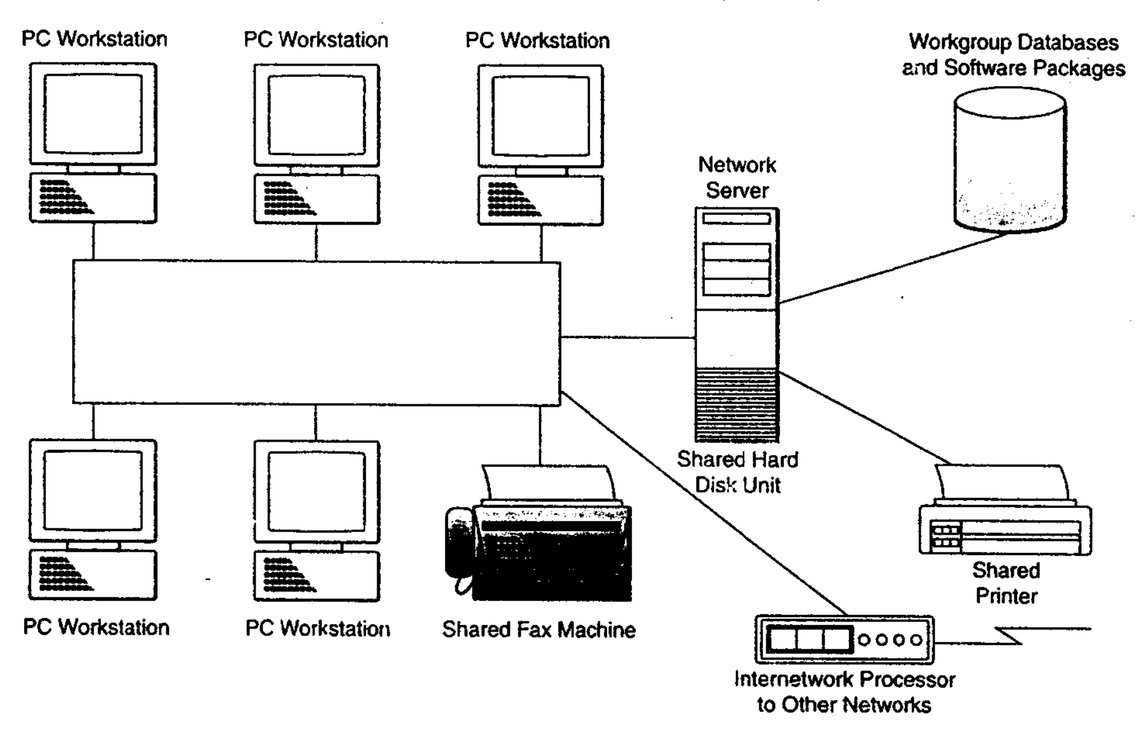
Source: Courtesy of Banyan Systems Incorporated.

group projects. For example, a project team of end users whose microcomputer workstations are interconnected by a LAN can send each other *electronic mail* messages and share the use of laser printers and hard magnetic disk units, copies of electronic spreadsheets or word processing documents, and project databases. LANs have thus become a more popular alternative for end user and work group computing than the use of terminals connected to larger computers.

Internetworks

Most local area networks are eventually connected to other LANs or wide area networks to create **internetworks**. That's because end users need to communicate with the workstations of colleagues on other LANs, or to access the computing resources and databases at other company locations or at other organizations. This frequently takes the form of *client/server* networks, where end user microcomputer workstations (*clients*) are connected to LAN *servers* and interconnected to other LANs and

FIGURE 6.7
A local area network (LAN). Note how this LAN allows users to share hardware, software, and data resources.



their servers, or to WANs and their mainframe *superservers*. Local area networks rely on **internetwork processors**, such as *bridges*, *routers*, *hubs*, or *gateways*, to make *internetworking* connections to other LANs and wide area networks.

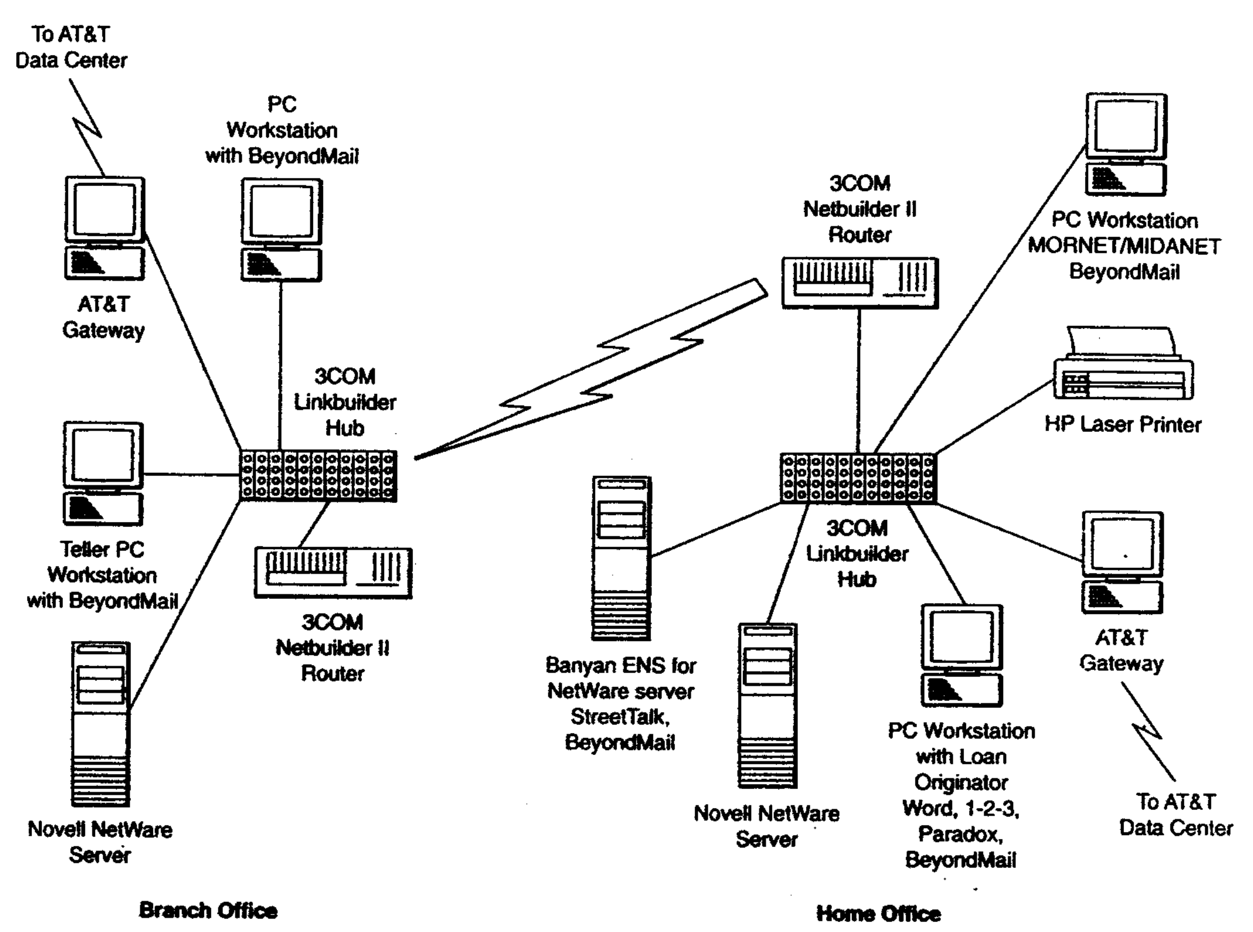
The goal of such internetwork architectures is to create a seamless "network of networks" within each organization and between organizations that have business relationships. Such networks are designed to be open systems, whose connectivity provides easy access and interoperability among its interconnected workstations, computers, computer-based devices, databases, and other networks. Many companies, universities, and other organizations are creating such internetwork structures. Figure 6.8 is an example of an internetwork architecture.

Client Server Computing

> Client/server technology promises many things to many people: to end users, easier access to corporate and external data; to managers, dramatically lower costs for processing; to programmers, reduced maintenance; to corporate planners, an infrastructure that enables business processes to be reengineered for strategic benefits. Whether client/server lives up to these promises will depend in large part on how carefully it is planned for, and how intelligently policies are put forth to manage it [13].

Client/server computing has become the model for a new *information architecture* that will take enterprisewide computing into the 21st century. We introduced client/server networks in Chapter 4, in our discussion of networked computer systems. Computing power has rapidly become distributed and interconnected throughout many organizations through networks of all types of computers. More

FIGURE 6.8
An example of the internetwork architecture of South Boston Savings Bank.

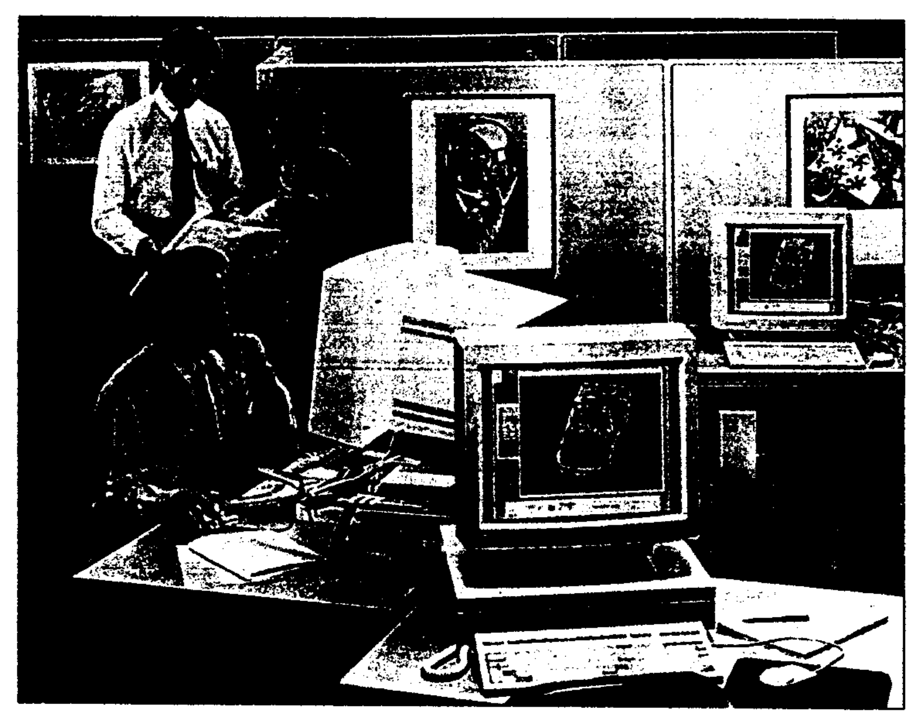


Source: Courtesy of Banyan Systems Incorporated.

and more, networked computer systems are taking the form of client/server networks. In a client/server network, end user microcomputer workstations are the clients. They are interconnected by local area networks and share application processing with LAN servers, which also manage the networks. These local area networks may also be interconnected to other LANs and wide area networks of client workstations and servers. See Figures 6.9 and 6.10.

With client/server computing, end users at client LAN workstations can handle a broad range of information processing tasks. They can thus perform some or most of the processing of their business applications. This includes data entry and other user interface activities, inquiry response, transaction processing, updating databases, generating reports, and providing decision support. LAN servers can share application processing, manage work group collaboration, and control common hardware, software, and databases. Thus, data can be completely processed locally, where most input and output (and errors and problems) must be handled anyway, while still providing access to the workstations and servers in other networks. This provides computer processing more tailored to the needs of end users

FIGURE 6.9
Client/server networks enable cooperative processing among end user workstations and network servers.



Courtesy of Hewlett-Packard Company.

and increases information processing efficiency and effectiveness as users become more responsible for their own applications systems.

Client/server computing also lets large central-site computers handle those jobs they can do best, such as high-volume transaction processing, communications network security and control, and maintenance and control of large corporate databases. User clients at local sites can access these *superservers* to receive corporatewide management information or transmit summary transaction data reflecting local site activities.

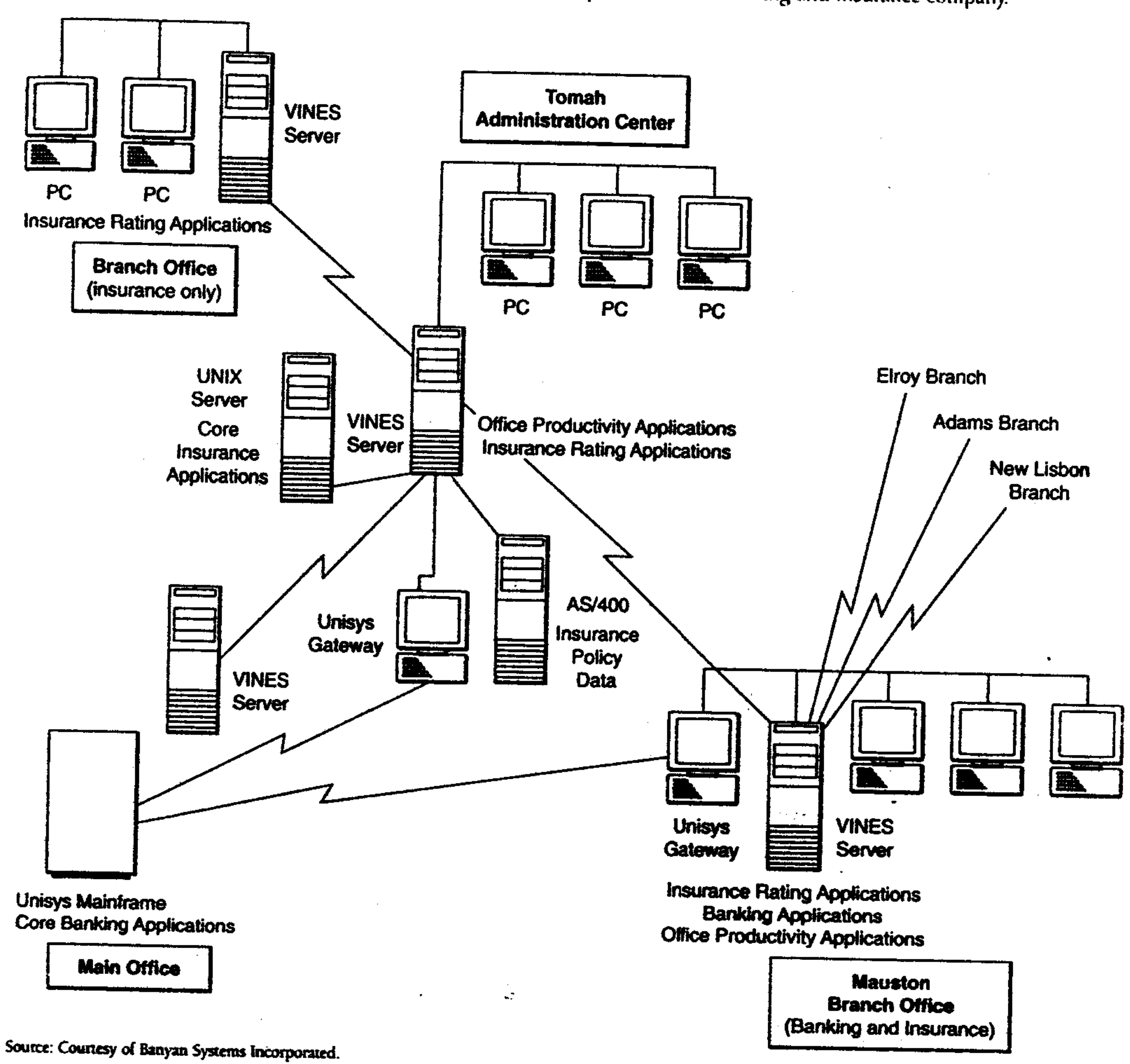
Distributed Processing

Client/server computing is the latest form of **distributed processing.** In *distributed processing*, information processing activities in an organization are accomplished by using a network of computers interconnected by telecommunications links instead of relying on one large *centralized* computer facility or on the *decentralized* operation of several independent computers. For example, a distributed processing network may consist of mainframes, minicomputers, and microcomputers, dispersed over a wide geographic area and interconnected by wide area networks. Or it may take the form of a client/server network of end user workstations and network servers distributed within user departments in interconnected local area networks.

Cooperative Processing

Client/server computing may also involve **cooperative processing.** Cooperative processing allows the various types of computers in a distributed processing network to share the processing of parts of an end user's application. Application software packages are available which have common user interfaces and functions so they can

FIGURE 6.10
A client/server model for distributed and cooperative processing. Note the functions performed by different types of computers acting as clients, servers, and superservers for the Westland Group; a Wisconsin banking and insurance company.



Source: Courtesy of Banyan Systems Incorporated.

operate consistently on networks of micro, mini, and mainframe computer systems. For example, an end user could use a spreadsheet package provided to his or her microcomputer workstations by a local area network server to perform financial analysis on databases managed by a corporate mainframe.

Telecommunications Carriers

Telecommunications channels for wide area networks can be owned by an organization or provided by other companies. In the United States, several companies have traditionally used a variety of communications media to create networks that can provide a broad range of communications services.

Common Carriers

These **common carriers** provide the wide area communications networks used by most computer-using firms and individuals. They have traditionally been authorized by government agencies to provide a selected number of communication services to the public. Examples are the former Bell operating companies, General Telephone and Electronics, Western Union, and many independent telephone companies. Some common carriers specialize in selling long-distance voice and digital data communications services in high-density areas of the country and the world. Examples of such specialized carriers are AT&T Long Distance, ITT World Communications, Southern Pacific Communications, U.S. Sprint, and MCI Communications.

Common carriers can provide an organization needing the data communications capabilities of a wide area telecommunications network with several options. For example, an organization could use regular, voice-grade, direct-distance dialing (DDD), which is more expensive, slower, and less reliable than other options due to delays caused by excessive communications traffic and the noise of voice-switching circuits. Or it could sign up for a wide area telephone service (WATS) and pay a monthly fee and a per hour fee for use of a set amount of telephone line capacity. This would be cheaper for an organization with a lot of communications activity, but it would have the same reliability problem as DDD.

A company could lease its own communications lines (called *leased lines*) from telephone companies and be guaranteed exclusive use of a low-noise, fast communications channel. However, this is an expensive alternative that is economically feasible only for large corporations and government agencies with massive data communications needs. Another expensive option is the use of a company that provides communications satellite services. Or an organization could build a *bypass* system, in which it installs its own dish antennas and bypasses the common carrier networks and transmits directly to communications satellites. Once again, this is a more expensive alternative attractive only to organizations with a high volume of data communications.

Value-Added Carriers

Other major communications carriers are companies called **value-added carriers**. These are third-party vendors who lease communications lines from common carriers and offer communications services to customers. Typically, messages from customers are transmitted in groupings called packets, via *packet-switching* networks. However, the networks of such carriers are known as *value-added networks* (VANs), because they add value to their leased communications lines by using communications hardware and software and their expertise to provide not only packet switching but other data communication services. Value-added networks also take over the responsibility for the management of the network, thus relieving their customers of the technical problems inherent in long-distance communications.

Value-added carriers offer their customers, or *subscribers,* high-quality, relatively low-cost service in return for a membership fee and usage charges based on the amount of communications activity accomplished. By spreading the cost of leasing the lines among many subscribers and using the capacity of the lines intensively, they are able to sell their services at attractive prices and still make a profit. Examples of value-added companies are GTE Telenet, General Electric's Mark Net, and Compunet by CompuServe. These VANs have become so popular that common carriers such as the Bell operating companies, AT&T, MCI, and Western Union and large corporations such as IBM and RCA now offer VAN services.

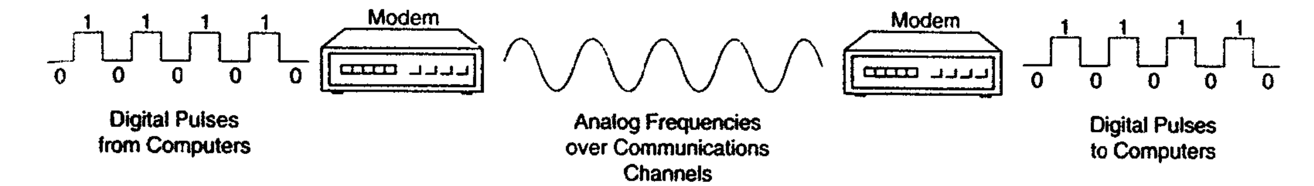
Telecommunications Processors

Telecommunications processors such as modems, multiplexers, bridges, front-end processors, and other devices perform a variety of support functions between the terminals and computers in a telecommunications network. Let's take a look at some of these devices and their functions. See Figure 6.18.

FIGURE 6.18
A summary of important communications processors.

- **Modem:** Serves as a telecommunications interface for personal computers and converts transmissions from digital to analog and back.
- **Multiplexer:** Allows a single communications channel to carry simultaneous data transmissions from many terminals.
- **Internetwork processor:** Includes bridges, routers, hubs, and gateways which interconnect a local area network with other local and wide area networks.
- **Private branch exchange:** Switches external and internal voice and data transmissions over telephone lines within an office or other work area.
- **Front-end processor:** Handles data communications control and network management functions for a larger computer.

FIGURE 6.19
Modems perform a modulation-demodulation process that converts digital signals to analog and back.



Modems

Modems are the most common type of communications processor. They convert the *digital* signals from a computer or transmission terminal at one end of a communications link into analog frequencies, which can be transmitted over ordinary telephone lines. A modem at the other end of the communications line converts the transmitted data back into digital form at a receiving terminal. This process is known as *modulation* and *demodulation*, and the word *modem* is a combined abbreviation of those two words. Modems come in several forms, including small stand-alone units, plug-in circuit boards, and microelectric modem chips. Many modems also support a variety of telecommunications interface functions, such as transmission error control, automatic dialing and answering, and a faxing capability.

Modems are used because ordinary telephone networks were primarily designed to handle continuous analog signals (electromagnetic frequencies), such as those generated by the human voice over the telephone. Since data from computers are in digital form (voltage pulses), devices are necessary to convert digital signals into appropriate analog transmission frequencies and vice versa. However, *digital communications networks* that transmit only digital signals and do not need analog/digital conversion are becoming commonplace. Since most modems also perform a variety of telecommunications support functions, modems may still be needed in digital networks. See Figure 6.19.

Multiplexers

A **multiplexer** is a communications processor that allows a single communications channel to carry simultaneous data transmissions from many terminals. Thus, a single communications line can be shared by several terminals. Typically, a multiplexer merges the transmissions of several terminals at one end of a communications channel, while a similar unit separates the individual transmissions at the receiving end.

This is accomplished in two basic ways. In *frequency division multiplexing* (FDM), a multiplexer effectively divides a high-speed channel into multiple slow-speed channels. In *time division muliplexing* (TDM), the multiplexer divides the time each terminal can use the high-speed line into very short time slots, or time frames. The most advanced and popular type of multiplexer is the *statistical time division multiplexer*, most commonly referred to as a statistical multiplexer. Instead of giving all terminals equal time slots, it dynamically allocates time slots only to active terminals according to priorities assigned by a telecommunications manager.

Internetwork Processors

As we have previously mentioned, many local area networks are interconnected by **internetwork processors** such as *bridges, routers, hubs*, or *gateways* to other LANs or wide area networks. A *bridge* is a communications processor that connects two similar LANs, that is, LANs based on the same network standards or *protocols*. A *router* is a communications processor that connects LANs to networks based on different

protocols. A *hub* is a *port switching* communications processor. Advanced versions of hubs provide automatic switching among connections called *ports* for shared access to a network's resources. LAN workstations, servers, printers, and other LAN resources are connected to ports, as are bridges and routers provided by the hub to other LANs and WANs. Networks that use different communications architectures are interconnected by using a communications processor called a *gateway*. All these devices are essential to providing connectivity and easy access between the multiple LANs within an organization and the wide area networks connecting them to other company locations and organizations.

Private Branch Exchange

The private branch exchange (PBX) is a communications processor that serves as a switching device between the telephone lines within a work area and the local telephone company's main telephone lines, or *trunks*. PBXs can be as small as a telephone or as large as a minicomputer. They not only route telephone calls within an office but also provide other services, such as automatic forwarding of calls, conference calling, and least-cost routing of long-distance calls. Some PBX models can control communications among the terminals, computers, and other information processing devices in local area networks in offices and other work areas. Other PBXs can integrate the switching of voice, data, and images in *integrated services digital networks* (ISDN) that we will be discussing shortly.

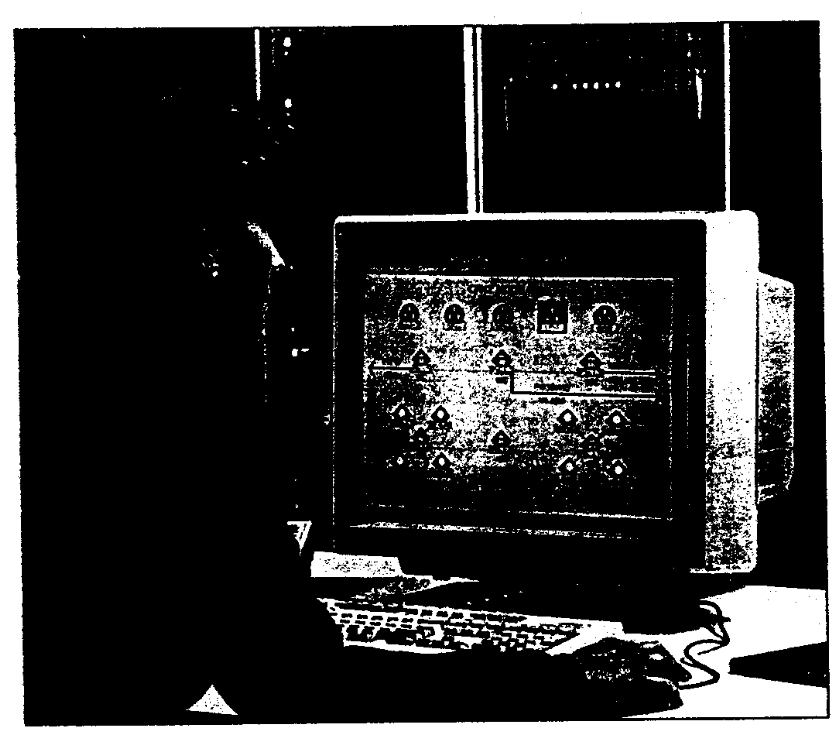
Front-End Processors

A **front-end processor** is typically a minicomputer dedicated to handling the data communications control functions for large mainframe **host computers**. For example, a front-end processor uses telecommunications control programs to provide temporary buffer storage, data coding and decoding, error detection, recovery, and the recording, interpreting, and processing of control information (such as characters that indicate the beginning and end of a message). It can also poll remote terminals to determine if they have a message to send or if they are ready to receive a message.

A front-end processor also has other, more advanced responsibilities. It controls access to a network and allows only authorized users to use the system, assigns priorities to messages, logs all data communications activity, computes statistics on network activity, and routes and reroutes messages among alternative communication links. Thus, the front-end processor can relieve the host computer of its data communications control functions so it can concentrate on its other information processing chores.

Telecommunications Software

Software is a vital component of all telecommunications networks. **Telecommunications control software** includes programs stored in the host computer as well as programs in front-end computers and other communications processors. Such software controls and supports the communications occurring in a telecommunications network. For example, telecommunications software packages for mainframe-based wide area networks are frequently called telecommunications monitors or *teleprocessing (TP) monitors*. CICS (Customer Identification Control System) for IBM mainframes is a typical example. Local area networks rely on software called **network operating systems**, such as Novell NetWare or Microsoft LAN Manager. Many communications software packages are also available for microcomputers, as we discussed in Chapter 5. See Figure 6.20.



Matthew Bonkoski/Stock Boston.

FIGURE 6.20
This display of a telecommunications monitor shows the status of local area and wide area networks.

Common Software Functions

Telecommunications software packages provide a variety of communications support services. The number and type of terminals, computers, communications processors, and communications activities involved determine the capabilities of the program required. However, several major functions are commonly provided by telecommunications packages.

Access Control

This function establishes the connections between terminals and computers in a network. The software works with a communications processor (such as a modem) to connect and disconnect communications links and establish communications parameters such as transmission speed, mode, and direction. Access control may also involve automatic telephone dialing and redialing, logging on and off with appropriate account numbers and security codes, and automatic answering of telephone calls from another computer. Many communications packages include a *script language* which allows you to develop programs to customize access control, such as accessing other computers at night or while you are away.

Transmission Control

This function allows computers and terminals to send and receive commands, messages, data, and programs. Some error che :king and correction of data transmissions may also be provided. Data and programs are usually transmitted in the form of files, so this activity is frequently called *file transfer*.

Network Management

This function manages communications in a telecommunications network. Software such as LAN network operating systems and WAN telecommunications monitors determines transmission priorities; routes (switches) messages, polls, and terminals in the network; and forms waiting lines (*queues*) of transmission requests. It also

logs statistics of network activity and the use of network resources by end user workstations.

Error Control

This function involves detection and correction of transmission errors. Errors are usually caused by distortions in the communications channel, such as line noise and power surges. Communications software and processors control errors in transmission by several methods, including *parity checking*. Parity checking involves determining whether there is an odd or even number of *binary one digits* in a character being transmitted or received. Besides parity bits, additional *control codes* are usually added to the message itself. These specify such information as the destination of the data, their priority, and the beginning and end of the message, plus additional error detecting and correcting information. Most error correction methods involve retransmissions. A signal is sent back to the computer or terminal to retransmit the previous message.

Security Management

This function protects a communications network from unauthorized access. Network operating systems or other security programs restrict access to data files and other computing resources in LANs and other types of networks. This restriction usually involves control procedures that limit access to all or parts of a network by various categories of users, as determined by the *network manager* or *administrator* of the network. Automatic disconnection and callback procedures may also be used. Data transmissions can also be protected by coding techniques called **encryption.** Data is scrambled into a coded form before transmission and decoded upon arrival.

(1)
Electronic Messaging and Mail Systems

Intoduction :

- Groupware deals with users working together as teams
- One vital requirement for collaborative work is the ability to share information and resources
- Client/server architecture allows concurrent Sharing of resources
- The goal of electronic messaging is to exchange and move information
- Users must also be able to locate, organise, filter, file and otherwise manage their shared data through a messaging infrastructure
- The backbone of the organisation that makes this possible is the network or interconnection of networks

The Popularisation of E-Mail :

- E-mail has been called the first successful groupware application
- More than any technology since the invention of the telephone, electronic mail has changed the way business people communicate. The proliferation of interoperable e-mail systems and services has made it possible to send a message across the hall or across the world and get a response in minutes or in hours...

E-mail and Organisation Memory:

- E-mails can be sent to groups as easily as to individuals
- Electronic mail systems involve e-mail databases which store the message as well as message/reply histories of electronic interchanges for specific topics or categories
- These databases contribute to the organisational memory within a corporation
- If the structure of a message as well as the content can be saved then the e-mail system can be used for more advanced querying and report generation capabilities
- For example, queries such as 'Retrieve all responses by Paul no later than 4/5/96 dealing with the Graduation Ceremony' can be processed

Four Basic Categories of E-mail Systems:

- Mainframe and Minicomputer e-mail systems
- LAN-based e-mail systems
- Internet-based e-mail
- Public communication and on-line services

Mainframe and Minicomputer e-mail systems:

- **Examples**
  - 3270 terminals on IBM mainframes
  - Professional Office System (PROFS), used by IBM
  - ALL-IN-ONE system by Digital Equipment Corporation

LAN-based e-mail systems:

- **These systems support many network operating systems such as Novell NetWare, Microsoft LAN Manager etc.**
- **Examples are cc.Mail, Microsoft Mail, QuickMail, BeyondMail etc.**
- **These systems are used in businesses for communication, topic discussion, meeting notification, exchange of forms etc.**

Internet-based e-mail:

- **The Internet allows users to access on-line information sources, to interchange messages, maintain forums for user groups with common interests etc.**
- **The Internet spans a variety of operating systems, platforms, hardware and networks**
- **The Internet also allows users to interchange e-mails using different e-mail systems**
- Internet address <Name>@<Institution Name>.<Organisation>.<Country>
  – e.g. Joanna1@mdx.ac.uk

Public communication and on-line services:

- **Most companies have their own e-mail systems**
- **Individual users can subscribe to public communication services for a fee**
- **Resource requirement are minimal- a workstation and a modem**

Purpose of E-mail:

- **e-mail is general purpose, a horizontal application**
- **used for many communication purposes such as.**
  - the exchange of ideas
  - reminder of project due dates
  - information dissemination e.g. meeting notices, agenda, policy statements etc.
  - circulation of documents for co-authoring
  - routing forms for approval

Advantages of E-mail:

- **easy to understand**
- **much faster**
- **less expensive transfer times**
- **reduces the amount of paper communication**
- **reduces the need for face-to-face meetings**

- **makes notification of meeting easier**
- **allows advanced capabilities such as**
    - intelligent filing
    - filtering
    - support of message threads which increases the productivity of an organisation
- **allows soft asynchronous interrupts**
- **wide availability**
- **connectivity through public e-mail systems**
- **maintain organisational memory**

E-mail Systems on the Client/Server Architecture:

- **runs on the client node**
- **allows user to interact with the email package through screens and dialogues**
- **notifies user when a message arrives**
- **receives messages from the e-mail server (or service)**
- **could be imbedded inside an application**

E-mail Transport Services:

- **the transport module is responsible for moving messages**
- **use store-and-forward communication to send messages**
- **messages may arrive out of order in disassembled packets**
- **the store-and-forward servers reassemble, then forward the message to the final destination using routing tables**
- **the store-and-forward strategy is achieved by the transport component working in conjuction with the directory, mail storage and other services on the network**
- **not important on a LAN but extremely important when messages are sent across networks and various geographical sites**
- **two prevailing connectivity standards**
    - CCITT X.400 (an industrial standard)
    - Novell's MHS
- **the transport service is usually sold separately by vendors**
- **e-mail packages indicate which transport services are supported**

Directory Services:

- **maintains the physical locations of users who can then be addressed physically or logically**
- **directories are stored either as files or databases**
- **entries in directories contain at least the users name and location**
- **better directories also contain access rights, passwords and login-IDs**
- **these services may be included in the e-mail system or sold separately**
    - e.g. StreetTalk from Banyan which is close to the industrial standard X.500
- **these services may be integrated into the network operating system**
- **the goal of the e-mail directory service is to read the network operating systems directory**

Message Database:

- **contains the messages that are in the system**
  - read messages
  - unread messages
  - message logs
  - information about the message originator
  - e-mail attachments
- **modern e-mail and messaging systems also store information about users, groups, messages, routing information, routing rules etc.**
- **typically back-end services**
- **goal is to have a common e-mail services interface which can be adopted by different back-end service vendors**
- **two most important APIs are**
  - MAPI (Microsoft)
  - VIM (Lotus)

Standards and Common Mail APIs :

- **require standards in both transport services and APIs for messaging systems**
- **Advantages of APIs - allows messages to be sent easily between different e-mail packages that use different heterogeneous workstations and operating systems**
- **if common APIs and standards are not supported, e-mail packages must be able to support gateways or interoperability between many heterogeneous e-mail systems**

Api standards:

- **MAPI**
- **CMC**
- **Simple MAPI**
- **Extended MAPI**
- **VIM**

Transport Standards:

- **Netware NETWare Global MHS**
- **X.400**
- **Internet and Simple Transport Protocol (SMTP)**

Interconnecting E-Mail Systems:

- **If X.400 standards are adhered to then there is no problem in communication**
- **If X.400 standards not used then use**
  - gateways
  - switches

Gateways:

- guarantee interoperability and interchange between different packages
- perform conversions between the different protocols of heterogeneous e-mail systems
- provide bi-directional conversion and communication between two different e-mail systems
- work well when only a few e-mail systems are involved
- need a gateway between each pair of e-mails systems

Switches (multi-gateway switches):

- better for larger organisations
- provide connections between many different e-mail systems
- functions supported by switches include e-mail protocol conversion, directory synchronisation, address translation and document conversion
- often make two translations where as gateways only make one
- source - intermediate form - destination

Address Books for User and Groups:

- an address book is the information on the set of users of the e-mail package
- the information contained can include name, company name, employee number, office number, office address phone number etc.
- more advanced systems allow the user to define the attributes of the address book
- can contain levels of security e.g. read only access or read/write access
- more advances systems allow 'intelligent address books to be created
- intelligent address books allow users to send e-mails to certain groups of people
    - e.g. Send the message to all users who live in London

Mail-enabled Applications:

- allows user to send documents from within an application
- can select e-mail option or send option from within the package
    - for windows applications it is contained in the file menu
- very convenient for the user
- one step further is to allow applications to exchange document parts through e-mail transport protocols
- smart mail-enabled packages allow documents to be sent to members of a group every time the main document is updated.
- documents are sent via the e-mail transport without human interaction

Message Content and Structure:

- e-mails have two components
    - text component
    - attachment component
- attachments are application documents, read through either
    - the original application program
    - an e-mail viewer

Smart E-mails and Advanced Electronic Messaging:

- **Filters and rules**
- **Multimedia and e-mails**
- **Document Annotations**
- **Message Type**
- **Notification and receipts**
- **E-mail security**

Filter and rules:

- **allows users to sort/filter messages according to rules**
  - e.g. only messages from John Smith
- **allows users to include an action to take place**
  - e.g. message subject Contains 'Production' AND 'Problems'
- **allows user to take action when a message is received**
  - e.g. If Message Subject 'Monday Funnies' THEN Delete Message
- **allows users to forward message automatically**
  - e.g. If Message Subject Is 'Insurance' THEN Forward Message to Legal Department

Multimedia and E-mail:

- **at present multimedia files can be included as attachments, this requires the recipient to have either the application or a viewer**
- **in more advanced packages, multimedia can be integrated within the e-mail system**
- **the goal is to make the creation and playback of multimedia elements as easy and transparent as text**

Document Annotations:

- **many packages allow documents to be annotated e.g. commenting, highlighting and authorising**
- **the goal is to be able to integrate annotation functionality with e-mail**

Message types:

- **modern e-mail systems allow users to create simple forms**
- **two types**
  - Mail-enabled form packages, implements mail-enabling within a forms package
  - Form editor within an e-mail system, much simpler forms

Notification and Receipts:

- **an e-mail system that incorporates a rule-based system can enable a user to specify rules that inform the sender if certain conditions are met**
  - e.g. Notification that message is delivered (receipt)
  - Notification that message is read (receipt-message read)
  - Notification when message is not read after a certain amount of time

E-mail Security:

- **growing problem as connectivity and e-mail expand within organisations**
- **need to make sure mission-critical data is secure both internally and externally from hackers etc.**
- **Main types of security**
  - Cryptography
  - Confidentiality, Authentication and Integrity
  - Digital signatures

Cryptography:

- **the base technology used to provide security services**
- **uses key1 to encrypt plaintext into ciphertext at the senders end and key2 to decrypt the ciphertext back into plaintext at the recipients end**
- **Two main types of decryption**
  - Symmetric cryptoalgorithms - use same key to encrypt and decrypt the plaintext
  - Asymmetric cryptoalgorithms uses two different keys.

Confidentiality, Authentication and Integrity:

- **Confidentiality: ensures that the content of the message has not been compromised**
- **Origin authentication: allows the recipient to protect the identity of the sender**
- **Message integrity: assures that the sent message is not altered before it is received**

Digital Signatures:

- **allows managers to sign digital forms and for their signatures to be authenticated**
- **uses public key cryptography**

Workflow
Computer-supported Collaborative Work Processing

- **At a first glance, workflow systems and groupware applications appear different to one another. Workflow systems seek to automate formal policies and procedures enabling the reengineering of basic business processes. Groupware applications seek to facilitate informal group interactions by enhancing communications, co-ordination and collaboration of task teams." (Bock, 1992)**
- **It is, simply put, the automation of the processes that we use every day to run our business. A workflow application automates the sequence of actions, activities or tasks used to run the process, including tracking of the status of each instance of the process, as well as tools for managing the process itself." (Marshak, 1994)**
- **"Workflow software is the tool that empowers individuals and groups in both structured and unstructured environments to automatically manage**

a series of recurrent or non-recurrent events in a way that achieves the business objectives of the company" (Palermo and McCreedy, 1992)

- "Workflow automation is the structure that is applied to the movement of information in order to improve the results of a business process. Workflow automation software actively manages the co-ordination of activities among people in general business processes" (Burns, 1994)

Examples of Workflow:

- Hiring an employee for a specific position
- Processing a loan
- Processing a purchase requisition
- Preparing a business plan
- Conducting research and trade in financial applications
- Conducting market research for trading

Characteristics of a Typical Workflow System:

- Computer-supported
- Collaborative
- Support work processing

Basic elements of a document imaging system:

- Scan
- OCR
- Index
- Storage
- Records, Archives, Versions
- Retrieval
- Processing Workflow

Taxonomies of Workflow Systems:

- Amount of programming required
- Messaged based and server based workflow
- Empowering the users
- Types of workflow technology

Amount of programming required:

- one extreme is to provide a programming language with built-in-terms that support workflow
- the other extreme is that everything is redefined or pre-programmed
- causes of rigidity in workflow systems
  - imposing a particular theory on a workflow implementation
  - limited set of primitives and closed system

Message-based and Server-based Workflow:

- **two types of email**
  - enhanced email applications
  - Mail-enabled applications with workflow capabilities
- **Server-based or database workflow**

Empowering Users:

- **trend for 21st century is to downsize corporations**
- **consist of teams of knowledge workers**
- **worker should be treated as creative, intelligent and educated knowledge workers**
- **intelligent workflow systems should assist the worker not tell them what to do**

Types of workflow Technology:

- **Transaction or Production Workflow**
- **Ad Hoc Workflow**
- **Administrative Workflow**
  - creation of simple forms
  - routing of forms
  - iteration of form completion
  - deadlines, notification, alarms and other workflow features

Main elements of a workflow system:

- **Objective**
- **Participants or participating nodes**
- **Flow or linking participants**
- **The document and forms being processed**

Object Orientated Workflow:

- **Object = Structure + Behaviour**
  - Structure - Data portion of the object
  - Behaviour - operations performed on the objects
- **Object-orientation = Abstract Data Type + Inheritance + Object Identity**

Object Orientated Features of Workflow Systems:

- **The 'everything is an object' paradigm permeates the product**
- **Templates/processes as classes and instances or activation's as objects**
- **Specialisation or inheritance**
- **Composite workflow, nesting and referential sharing**

Workflow Features and Concepts:

- **A diagramming graphics tool that depicts the process**
- **The routing mechanism and workflow engine**
- **The storage or databases fir the workflow meta-data and status information**

Components of workflow:

- **Graphical workflow definition**
- **Process definition activation**
- **Tracking, status and statistics**
- **Work queues**
- **Cases**
- **Groups and roles**
- **Retraction**
- **Rules and conditions**
- **Notification**
- **Suspense or rendezvous**
- **Iteration**
- **Workflow and project management: the importance of schedules and status**

Workflow Standards:

- **The Workflow Management Coalition (WMC) set up in August 1993 to**
  - address the issues of interoperability
  - ability of various workflow products to work together

Workflow Architecture (client/server):

- **On the client node:**
  - Workflow design tool
  - Workflow activation tool
  - Workflow tracking, status
- **On the server node**
  - Workflow manager service
  - Database management service
  - Messaging, transport and communication services

Client - Workflow design tool:

- **allows for the definition of workflow templates.**
- **can be a graphical design tool**
- **can be a scripting environment including parsers, debuggers and development environment for 4th generation scripting languages used for workflow definitions or design**
- **responsible for 'activating' the workflow templates in terms of functionality**
- **handles much of the 'handshaking' between the workflow service manager and the client node when starting, terminating or suspending a workflow**

Client - Workflow tracking, status:

- **can be integrated in the activation tool**
- **the workflow status management tool displays the status of various active workflows**
  - ***indicates the time taken to complete various tasks***
  - ***used top identify potential bottlenecks***

– *improve the performance of workflow in future iterations*

Client - Workflow tracking, status cont:

- **interacts with the workflow engine to retrieve information about workflow status from the underlying workflow database**

Server - -Workflow manager services:

- **all the workflow engine-specific functionality is combined in this large module**
- **performs the following**
    - the actual interpretation of workflow templates
    - the tracking of workflow status
    - the maintenance of workflow users, groups, roles
    - every aspect of defining and running workflows (except for front end graphical modules)

Server - Database management services:

- **needs to interact with external modules such as a DBMS**
- **allows the workflow system to incorporate concurrent sharing capabilities**
- **allows multiple users to concurrently read and/or update objects under transaction control**
- **using the the persistence and concurrency control capabilities of a DBMS the workflow engine allow the workflow objects to be defined, created, searched and updated**

Server - Messaging, transport and communication services:

- **workflow systems incorporate an e-mail transport service interface (relatively inexpensive platform on which to exchange workflow messages)**
- **e-mail provides**
    - a database to store messages
    - an address book
    - a directory service
- **network operating system provides**
    - file storage
    - directory service
    - application servers

(2)
Electronic Meetings

- Tools for augmenting collaboration and problem solving within a group geographically collocated in real time
- Real time tools for collaboration among people who are geographically distributed
- Tools for asynchronous collaboration among teams distributed geographically

Working Definitions

- Collaboration - people or organisations working toward a common purpose
- Meetings - occasions for collaborations to take place.

Synchronous local meetings and collaborations

- Time management and scheduling
- Advanced scheduling features
- Security and access privileges
- Lists and notes
- Notifies and alarms

Time management and scheduling

- Personal information managers
- Group schedulers
- Enterprise-wide group scheduling

Synchronous local meetings

- **meeting categories**
  - same time, same place
  - same time, different place
  - different times. Same place
  - different times, different places

Synchronous and colocal meetings (same time, same place)

- Electronic copy-boards
- PC and a projector
- Team rooms
- Group decision support systems

Synchronous and colocal meetings cont..

- computer-enabled meeting rooms
  - brainstorming
  - issue analysis
  - prioritising
  - policy formation
  - stakeholder identification

Synchronous and colocal meetings cont.

- electronic meeting support systems
  - group support systems
  - group decision support systems groupware

Synchronous and remote meetings (same time, different place)

- teleconferencing
- videoconferencing
- data conferencing
- virtual reality and cyberspace

Teleconferencing

- desktop teleconferencing
- electronic virtual meeting rooms
- voice mail
- fax-mail

Conferencing Software Features

- two fundamental element essential to any meeting are people and information
- meetings software allows the developing of options by
  - anonymity that encourages off-the-wall ideas without embarrassment
  - open access to participants
  - quick display and feedback

Information Centred Meetings

- Information is the lifeblood of society
- current technologies limit the amount of information available within the meeting space I.e. limited due to bandwidth
- limited information can be an advantage as it allows issues of

personality etc to be removed allowing participants to concentrate on the more important issues.

Information Centred Meetings cont.

- by restricting the amount of information available about te actual participants also allows anonymity,
- anonymity allows participants to concentrate on the message rather than the messenger.
- can be an advantage in brainstorming as participant feel more free to contribute.

Distributed Meetings

- A distributed meeting takes place over a period of time. E.g..bulletin board forum
- Distributed electronic conferences can be held over email, voice mail, dedicated software
- Benefits of distributed meetings include getting information from people who would not normally contribute to face-to-face meetings.

Working together: Collaborative authoring

- Working together: Collaborative authoringcollaboration technology is any IT which over comes
  - distance
  - heterogeneity of databases and computer systems
  - co-ordination and global visibility of common information
  - usability

Working together: Collaborative authoring

- **Meeting vs. Authoring**
- **Interactive editors**
- **Participatory design**
  - whiteboards
  - brainstorming
  - videoconferencing
  - video telephones

(3)

Vedioconferencing

Introduction

Using ***videoconferencing*** technology, two or more people at different locations can see and hear each other at the same time, sometimes even sharing computer applications for collaboration. This rich communications technology offers new possibilities for schools, colleges, and libraries, who are now using videoconferencing systems for a variety of purposes, including formal instruction (courses, lessons, and tutoring), connection with guest speakers and experts, multi-school project collaboration, professional activities, and community events.

Placing a video call is a lot like placing a telephone call. After you connect, you see the other person in color video and may be able to transfer files or collaborate via options such as document sharing or whiteboarding. The video frame rate varies from 5-30 frames per second, depending on the connection, hardware, and software.

By combining broadcast-quality video with high speed digital telephony equipment, videoconferencing technology allows users thousands of miles apart to exchange information or collaborate on projects with the same efficiency as face-to-face meetings.

Benefits

As an interactive communication medium, two-way video stands out in a number of ways. First of all, it's almost like being there.The visual connection and interaction among participants enhances understanding and helps participants feel connected to each other. This goes a long way toward building relationships in a way that e-mail, telephone, or online chat systems cannot, supporting collaboration among traditionally isolated institutions. A videoconference can improve retention and appeal to a variety of learning styles by including diverse media such as video or audio clips, graphics, animations, computer applications.

There are some way helps video conference as follows

- Improves daily communication, presentation, and "SCANS" skills
- Increases Connection with the Outside World
- Increases Depth of Learning
- Speed decision making
- Increase access to expertise
- Enhance customer service
- Train the workshop
- Manage global enterprise

How schools, colleges, and libraries are using videoconferencing technology?

- Courses, Lessons, and Tutoring
- Remote Guest Speakers and Experts
- Multi-School Projects
- Professional Activities
- Community Events

Courses, Lessons, and Tutoring

Videoconferencing systems are often used for distance learning, linking distant teachers and learners for instruction.

Here are a few ways videoconferencing might be used for instruction:

Students can takes classes not offered at their school, such as advanced honors or foreign language courses.

Schools and community colleges can offer classes during off-hours and to students who cannot attend traditional classes.

Community colleges can team up with businesses to offer employee training or certification.

Teachers can team-teach with remote teachers, sharing subject matter expertise or a unique approach to a topic. This is great way for businesses to support schools.

A librarian could offer an introduction to library services and library tour for local schools.

Remote Guest Speakers and Experts

Your class can communicate first-hand with experts in many fields to enhance understanding of a subject they are studying. This real-world contact can heighten interest, improving motivation and retention. Connecting with a guest is also an easy way to enter into videoconferencing.

Here are some ways guests could enhance learning:

- Students could organize and moderate a panel discussion
- A librarian could answer questions about research.
- Students could connect with athletes at an Olympic Training Center for advice and feedback on sports, training, and health issues.
- Students could watch a play performed at a remote site followed by interaction with the actors.
- A small group could interview the author of a book the class is studying.
- A chemistry class could meet with scientists as part of a collaborative science project.
- Students could meet with university advisors for admission counseling or interviews.
- A remote teacher or student could role-play a historical or literary figure, sharing a special experience with a larger audience.
- A graphic arts student could share a document with a professional or client for feedback and evaluation.
- A vocational teacher could videoconference with a business partner to discuss internship projects and evaluation.

Multi-School Projects

Videoconferencing provides unique opportunities to collaborate on projects with schools across th country.

Teachers and students can collaborate and exchange information with other schools in areas such peer counseling, bilingualism, and student government.

Students can communicate with video pen pals to experience diverse cultures and ways of life, both economic and ethnic.

Schools known for outstanding programs or projects can model those projects for other schools.

Professional Activities

Videoconferencing provides many exciting opportunities for support of professional activities. The following describe creative and innovative uses of distance learning for teachers and librarians.

Students enrolled in teacher education courses can observe and critique innovative teaching practices in school classrooms and later discuss them with their peers.

In-service courses can be transmitted from universities and can enable teachers to participate without leaving their schools.

Teacher education faculty can observe and critique student teachers during their classes. Teachers can share teaching methods and curricula with peers in other districts Librarians can share expertise, ideas, and training with peers.

Community Events

Libraries, communitiy colleges, and schools can use videoconferencing to support events in the public interest, such as:

Town hall meetings, government hearings, school board meetings, court functions, and other government-related activities

Applications of Videoconferencing

Advertising, Promotion review, Board meetings, Customer Support, Distance Learning, Engineering Development, Financial reviews, Inter- & Intra- company project co-ordination, Legal depositions, Medical consultations, Project management/support, Telecommuting, Training

Types of Videoconferencing Systems

Room-size

Videoconferencing systems have diversified in recent years. Initially, "room-size" videoconferencing was the only method of delivery In this environment, a lecturer presented from a high-tech classroom to students attending both locally and remotely.

Room-size videoconferencing systems typically use high quality audio-visual components, sophisticated codecs, and feature-rich control devices to create an experience suitable for a room full of participants. Room-size videoconferencing is often used to support a traditional lecture mode characterized by:

one to many interaction controlled by the teacher, distinct and unequal participation, and more formal communication

Desktop

Recent advances in technology, and the increasing availability of ISDN as a cheap delivery media have promulgated the move toward "desktop" videoconferencing. Desktop systems use a personal computer with special hardware and software to code and decode the signal. This kind of system uses cheaper components and is most appropriate for individual or small group use. Desktop systems often include a

document sharing feature, which allows participants to see and edit a computer document as they see and hear each other. Document sharing and the relatively low cost of desktop systems make this an ideal tool for communication, collaboration, and learning.Desktop videoconferencing is characterized by:

many to many interaction , equal participation, more relaxed method of control, informal communication among participants

Basic Videoconferencing Technology

A videoconference system must have audio-visual equipment (monitor, camera, microphone, and speaker) as well as a means of transmitting information between sites. As you can imagine, a broadband satellite connection with studio-quality equipment produces an excellent full-motion video connection, but the equipment and transmission expense is great. Recent advances in computer and telecommunications technologies have sparked an interest in compressed video

systems, which transmit information via today's Internet or telephone network, greatly reducing the cost of videoconferencing.

Videoconferencing connections may be limited to a closed network (such as a LAN) or may use public networks (such as regular phone lines). Many videoconferences connect via ISDN (Integrated Services Digital Network) because it is an economical solution for high-quality videoconferencing. ISDN works over regular telephone lines, transmits at 128 Kbps per line, and provides dedicated bandwidth for smooth audio and video (15-30 frames per second).

Equipment Components

Codec

So what allows videoconferencing over regular telephone lines?

The answer is a piece of equipment called a codec (short for coder-decoder). The codec takes the analog video signal and codes (digitizes and compresses) it. The codec also has to decode (decompress and un-digitize) the received transmission, and you can probably guess that this kind of processing can take its toll on the video and sound quality. The most obvious consequence of a slow codec or low-bandwidth connection is a "jerky" picture and an audio time delay.

Video Equipment

Desktop systems display video in a small window on the computer monitor. Room systems have one or two large video monitors and usually display the local audience as well as the remote audience. The camera can be anything from a tiny desktop camera that sits on top of a computer monitor (desktop system) to a high-quality model with remote control pan and zoom features (room system). High-end systems often come with a document camera and a second video connection.

Audio

Most high-quality systems come with a microphone designed to work best with a small group of people. In many cases, an additional microphone can be connected as well, making your setup more versitile for larger groups. The best systems use sophisticated processing to cancel out background noise and echo.

Control

Controls allow users to place calls, adjust volume, and sometimes even pan and zoom the camera. Desktop systems display controls and tools on the computer monitor window. Room systems come with remote control or console devices.

Successful Videoconference

Effective communication skills are a key ingredient to successful videoconferencing. We recommend you consider the following:

- Learn the videoconferencing system
- Maintain eye contact
- Show interest in all participants
- Dress appropriately
- Move and gesture slowly and smoothly
- Maintain appropriate on-camera positioning
- Maintain enthusiasm towards the technology and the subject matter
- Speak in a strong, clear voice
- Use audio-visual aids

Summary

Finally, in encouraging a more collaborative environment, videoconferencing can decrease the time it takes to bring new products and services to market or to take an idea from the drawing board to the market. Travel for this process can be sharply reduced, and instant feedback and discussion does not have any barriers.

Chapter 11

Microsoft Office 2000

Microsoft Office

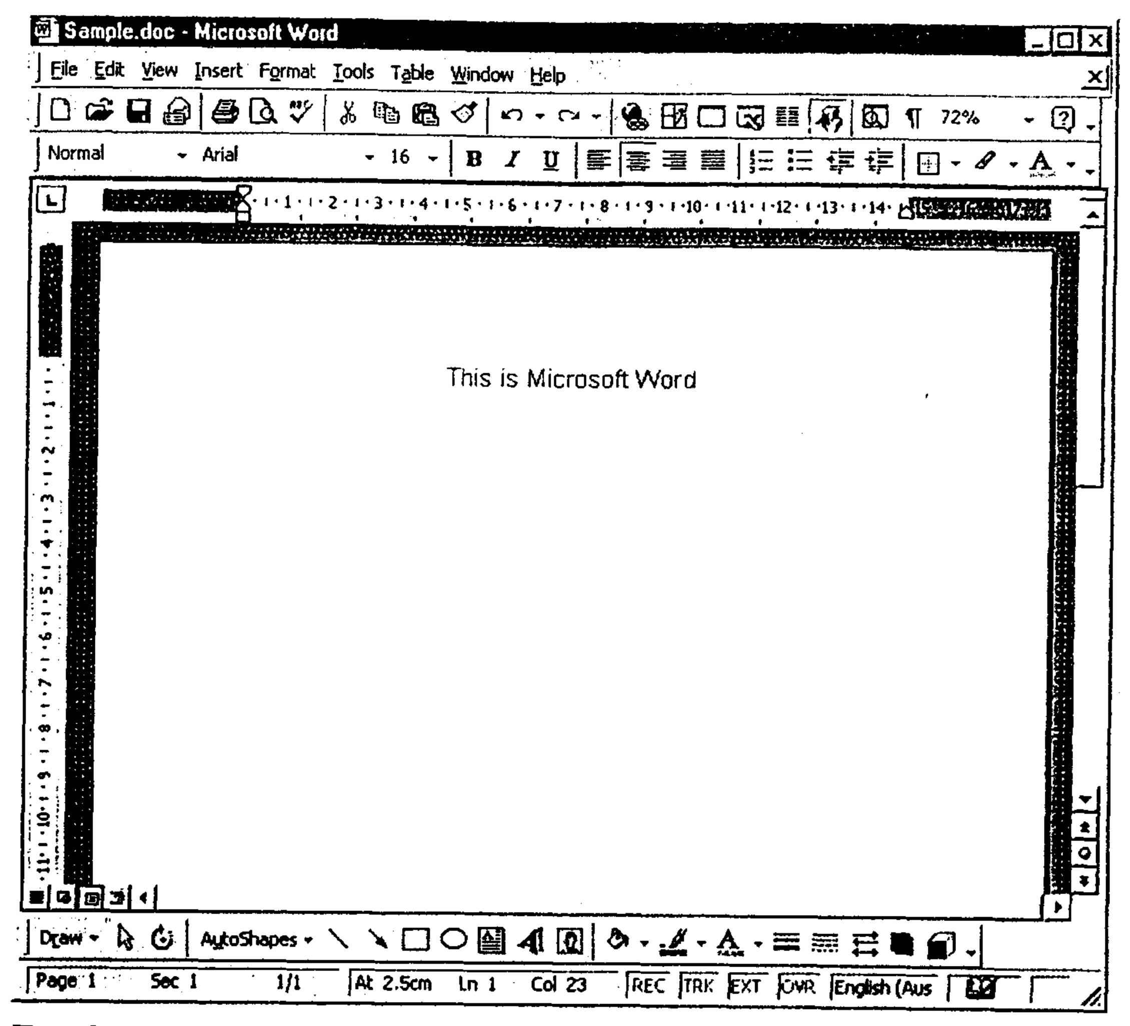
Microsoft Office is a suite of application programs produced by Microsoft for a range of general office requirements. The current version of the Office suite is Office 2000 and previous versions are Office 95 and Office 97.

Installing Office

The Office CD will be detected and run when it is inserted into the drive. The first option presented is the choice of a ***Typical*** or ***Custom*** installation. Most novice computer users select Typical, which is the simplest option, however not all programs and options will be installed. If you have a large hard drive, you can select Custom and then choose Select all Options. This will install all office programs and features, however it will take up a large amount of disk space. Otherwise if a Typical installation has been performed and the options required are not available the installation can be repeated at any time to delete existing features or install additional features.

Word

Word began life as a word processor. Through its evolution it has come to include desktop publishing (text boxes and graphics), web page editing, a browser, embedded applications such as Excel spreadsheets, and Macro programming using a tailored version of Microsoft's Visual Basic programming language.



Excel

Excel is a spreadsheet program that provides a grid of cells for data entry and a range of mathematical, financial and statistical functions to manipulate the data (such as sum, average and maximum values of data in columns or rows). This allows the creation of business spreadsheets for sales, staff or product information with the associated monthly costs, sales, wages and profits etc. Excel may also be used for data collection and simple statistical analysis in research.

Microsoft Excel - Excel Sample.xls

File Edit View Insert Format Tools Data Window Help

Annual Profits for 1999				
Month	Sales	Purchases	Salary	Gross Profit
January	17,460.00	9,438.00	1,045.00	6,977.00
February	18,259.00	8,454.00	1,145.00	8,660.00
March	14,990.00	9,940.00	1,045.00	4,005.00
April	15,868.00	10,846.00	1,045.00	3,977.00
May	16,189.00	9,785.00	1,045.00	5,359.00
June	16,334.00	8,630.00	1,217.00	6,487.00
July	16,594.00	9,486.00	1,121.00	5,987.00
August	16,178.00	9,786.00	1,045.00	5,347.00
September	17,065.00	10,497.00	1,045.00	5,523.00
October	15,946.00	9,946.00	1,198.00	4,802.00
November	16,812.00	8,928.00	1,045.00	6,839.00
December	17,648.00	9,996.00	1,231.00	6,421.00

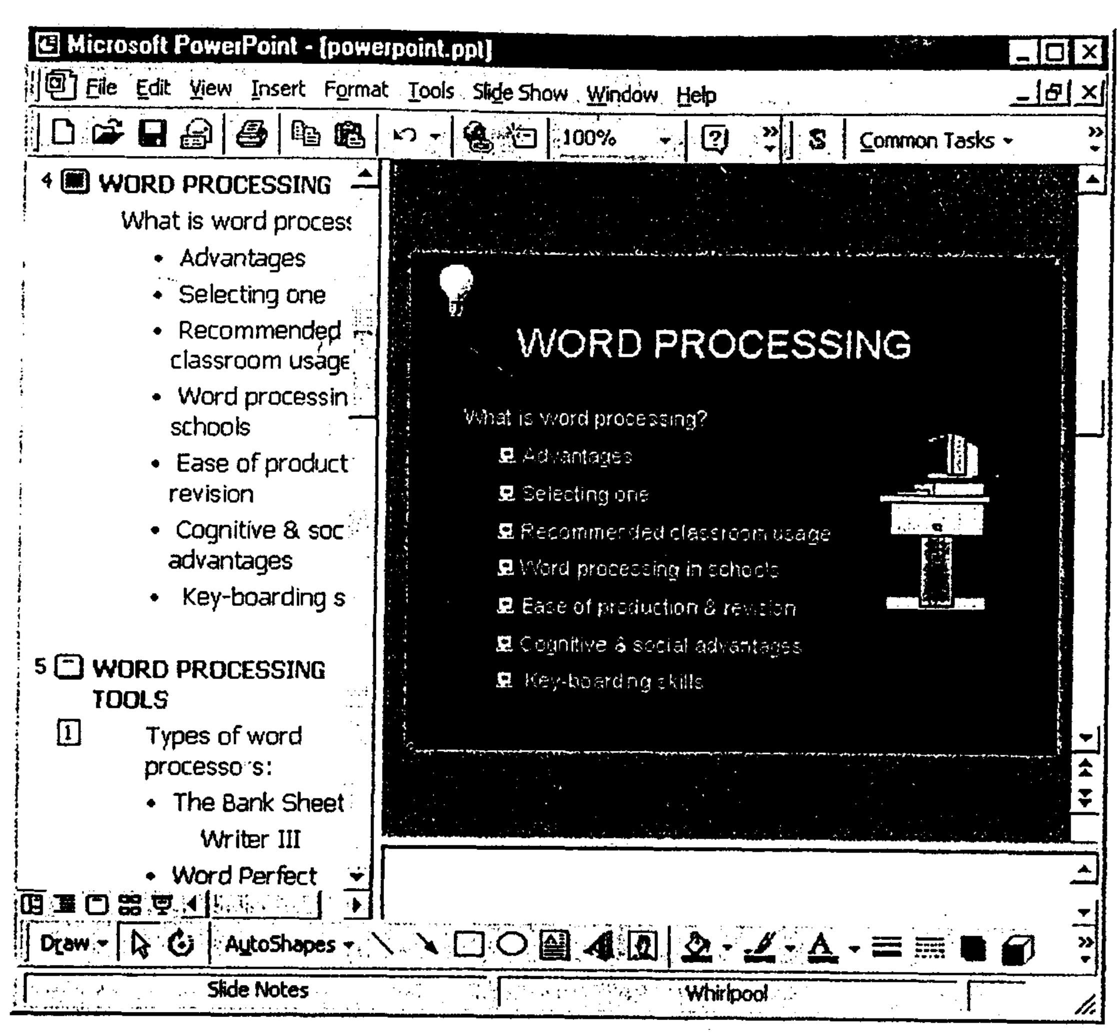
Annual Gross Profit	$ 70,384.00
Tax	$ 28,847.00
Annual Net Profit	$ 41,537.00

Sheet1 / Sheet2 / Sheet3

Ready NUM

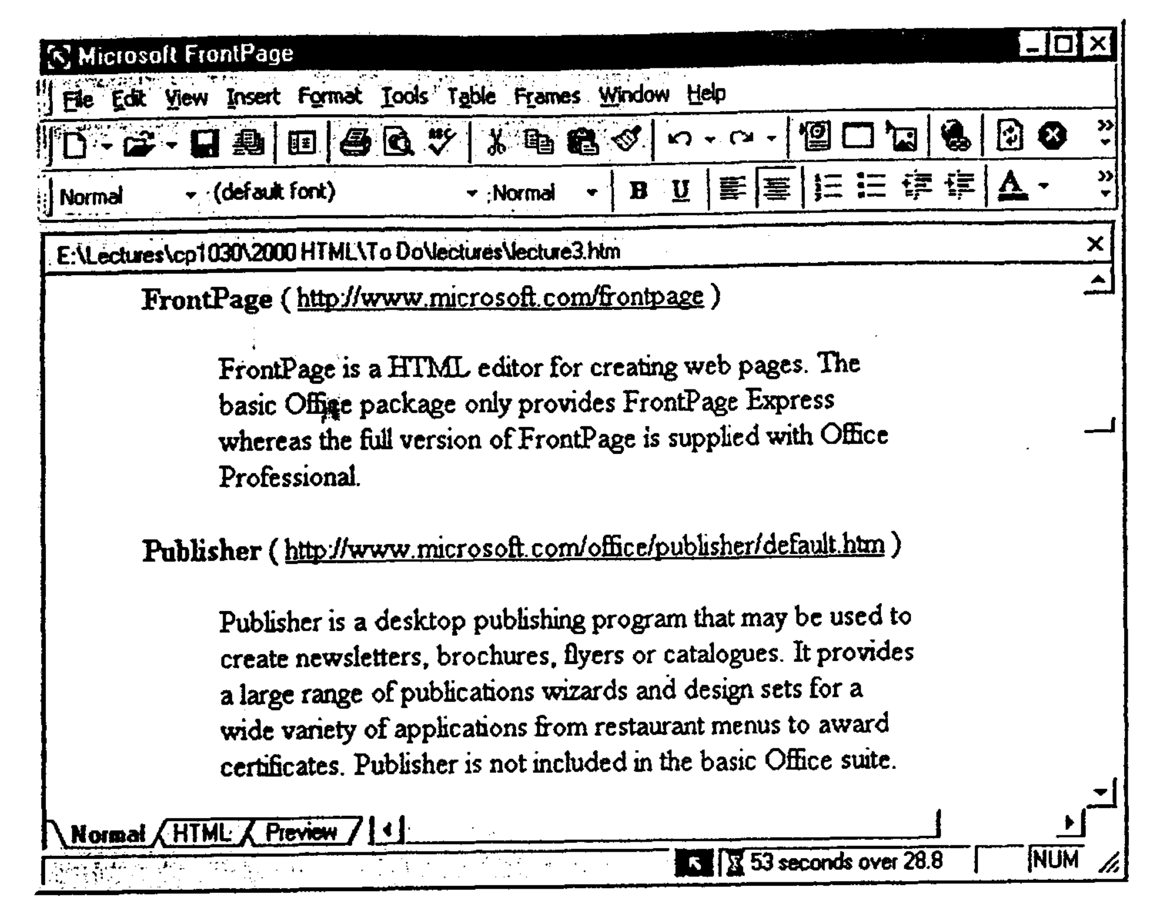
Access

Access is a database program. Where a spreadsheet allows random entry of data into a static grid, a database is arranged so that the data in a single table or multiple tables is related in a meaningful way. This allows checks and constraints to be performed when the data is inserted into the database. The management system also allows different on-screen forms to be constructed with buttons, text boxes and drop down menu's for viewing and updating various sections of the database. Information may also be extracted through printed reports.



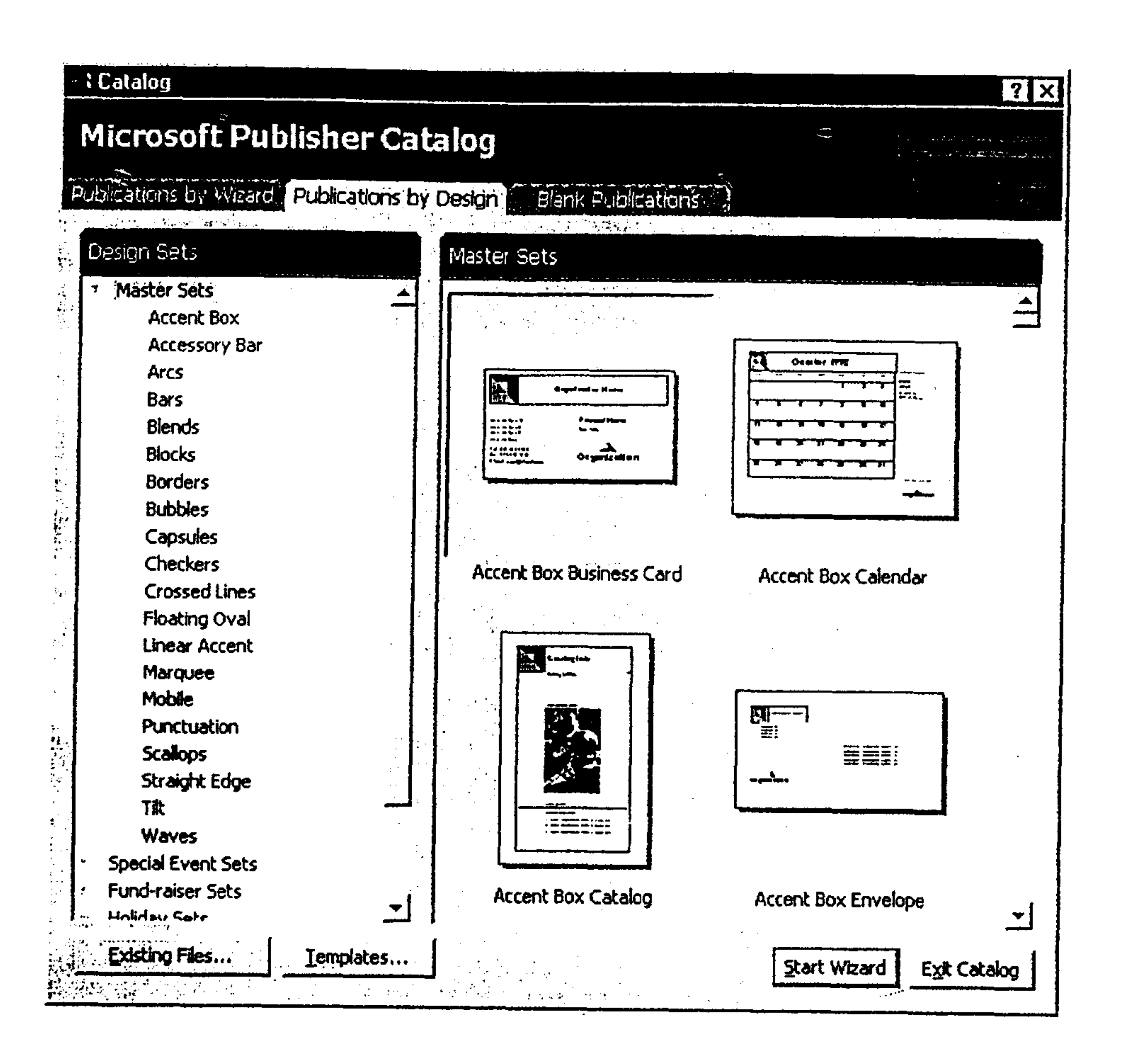
FrontPage

FrontPage is a HTML editor which is used to create web pages. FrontPage is as simple to use as Word and contains many of the same items in the menu's and toolbars. The full version of FrontPage is supplied with Office Professional whereas the basic Office package only provides FrontPage Express, which has all facilities of the full version other than the facility to edit the HTML code directly in the editor



Publisher

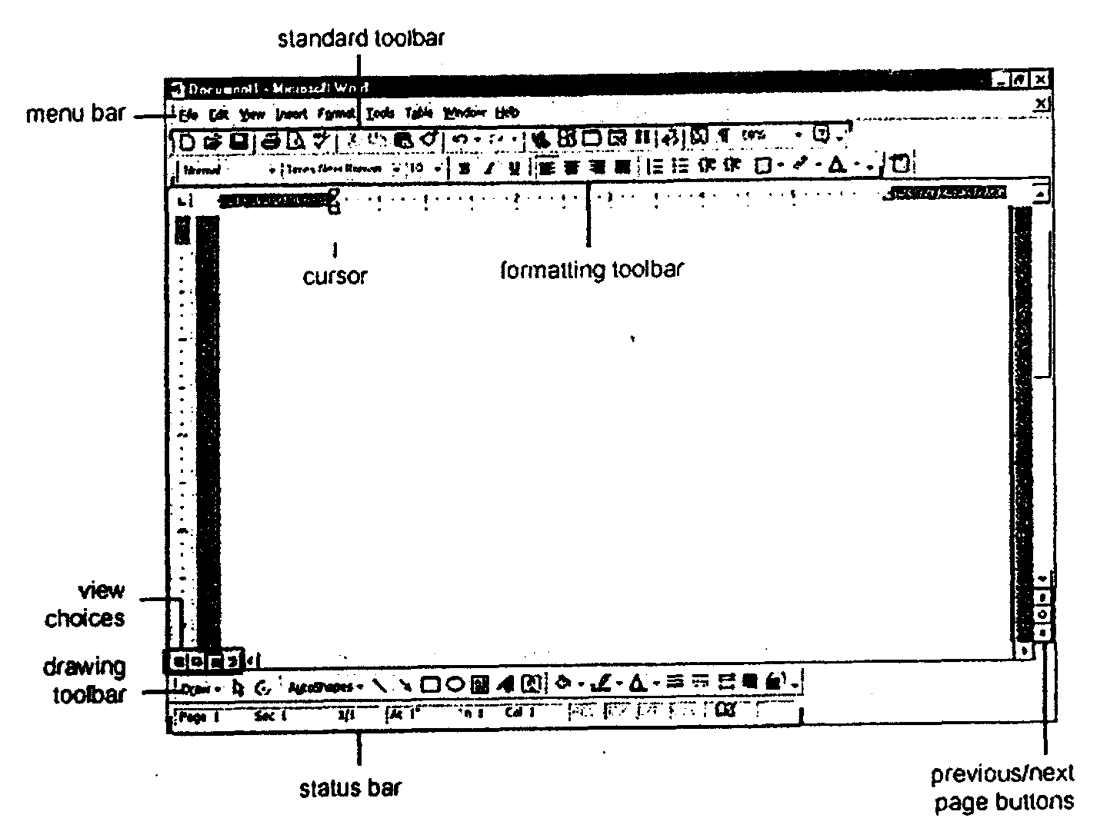
Publisher is a desktop publishing program that may be used to create newsletters, brochures, flyers or catalogues. It provides a large range of publication wizards and design sets for a wide variety of applications. These range from restaurant menus to award certificates. Publisher is included in the Office Professional package but not the basic Office suite.


Catalog
Microsoft Publisher Catalog
Publications by Wizard
Publications by Design
Blank Publications
Design Sets
Master Sets
Accent Box
Accessory Bar
Arcs
Bars
Blends
Blocks
Borders
Bubbles
Capsules
Checkers
Crossed Lines
Floating Oval
Linear Accent
Marquee
Mobile
Punctuation
Scallops
Straight Edge
Tilt
Waves
Special Event Sets
Fund-raiser Sets
Existing Files...
Templates...
Master Sets
Accent Box Business Card
Accent Box Calendar
Accent Box Catalog
Accent Box Envelope
Start Wizard
Exit Catalog

Word2000

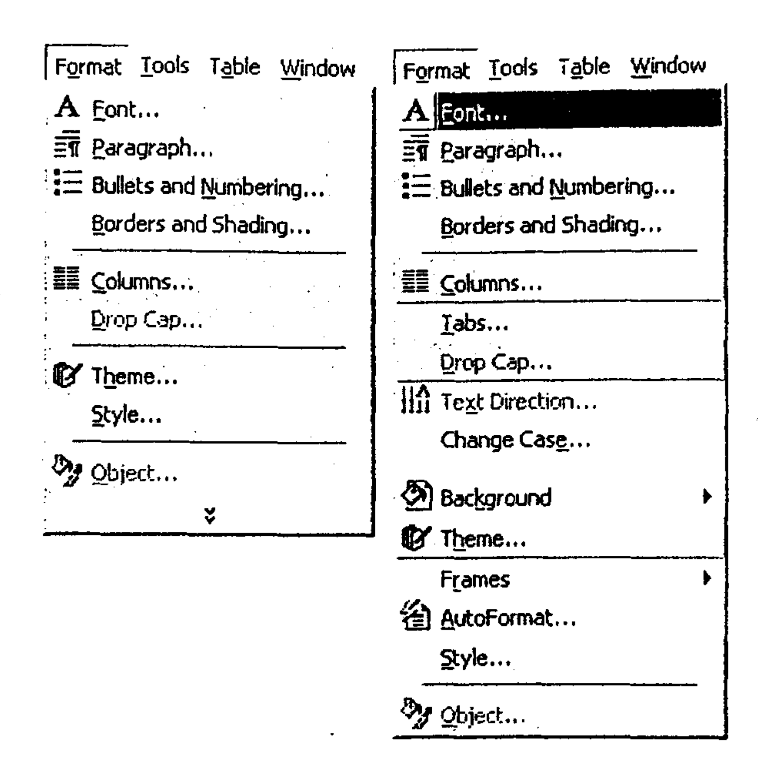
Getting Started

Screen Layout



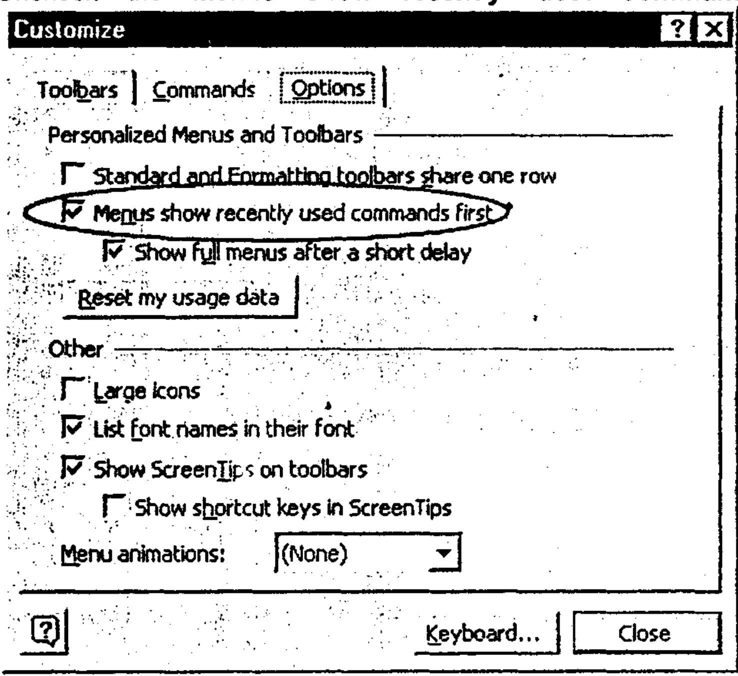
Menus

When you begin to explore Word 2000, you will notice a significant change in the menu structure if you are familiar with previous versions of Word. The menus in Word 2000 display only the commands you have recently used. To view all options in each menu, you must click the double arrows at the bottom of the menu. The images below show the Format menu collapsed (left) and expanded (right) after the double arrows at the bottom of the menu were clicked:



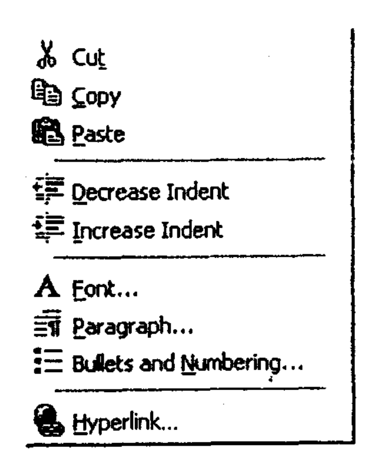
Follow the steps below to display menus similar to previous versions of Word with all the choices listed initially:

1. Select **View|Toolbars|Customize** from the menu bar.
2. Click on the **Options** tab.
3. Uncheck the **Menus show recently used commands first** check box.



Shortcut Menus

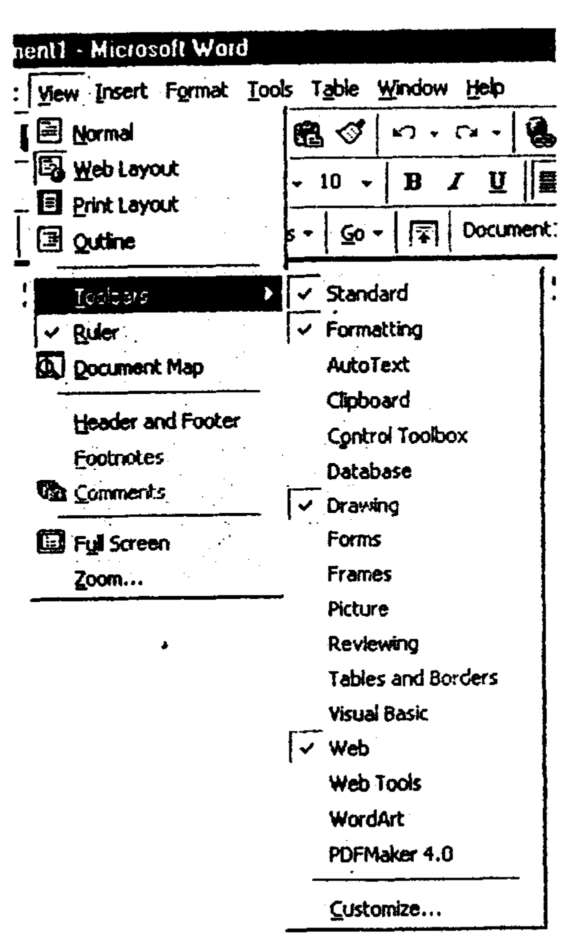
These features allow you to access various Word commands faster than using the options on the menu bar. View shortcut menus by right-clicking with the mouse. The options on this menu will vary depending on the element that was right-clicked. For example, the shortcut menu below is produced by right-clicking on a bulleted list.



Actions such as "Decrease Indent" and "Increase Indent" are only applicable to lists and therefore only appear on the list shortcut menu. The shortcut menus are helpful because they only display the options that can be applied to the item that was right-clicked and, therefore, prevent searching through the many menu options.

Toolbars

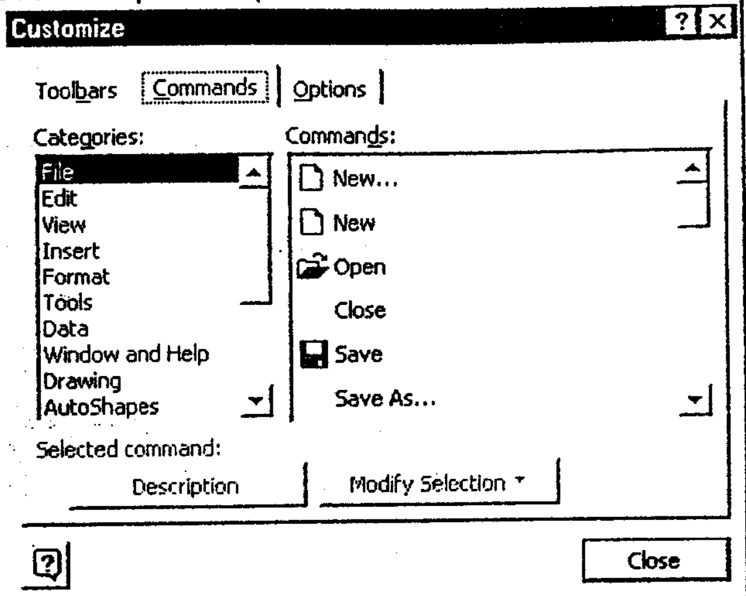
Many toolbars displaying shortcut buttons are also available to make editing and formatting quicker and easier. Select **View|Toolbars** from the menu bar to select the toolbars. The toolbars that are already displayed on the screen are checked. Add a toolbar simply by clicking on the name.



Customizing Toolbars

There may be certain actions on a toolbar that you do not use and there may also be commands that you execute often but that are not located on any toolbar. Word toolbars can be customized so these commands can be added and deleted.

1. Select **View|Toolbars|Customize** and click the **Commands** tab.



2. By highlighting the command categories in the **Categories** box, the choices will change in the **Commands** box to the right.
3. Select the command you would like to add to the toolbar by selecting it in the **Commands** box.
4. Drag the command with the mouse to the desired location on the toolbar and release the mouse button.
5. Remove a button from the toolbar by clicking and dragging the button off the toolbar.

Working With Files

There are several ways to create new documents, open existing documents, and save documents in Word:

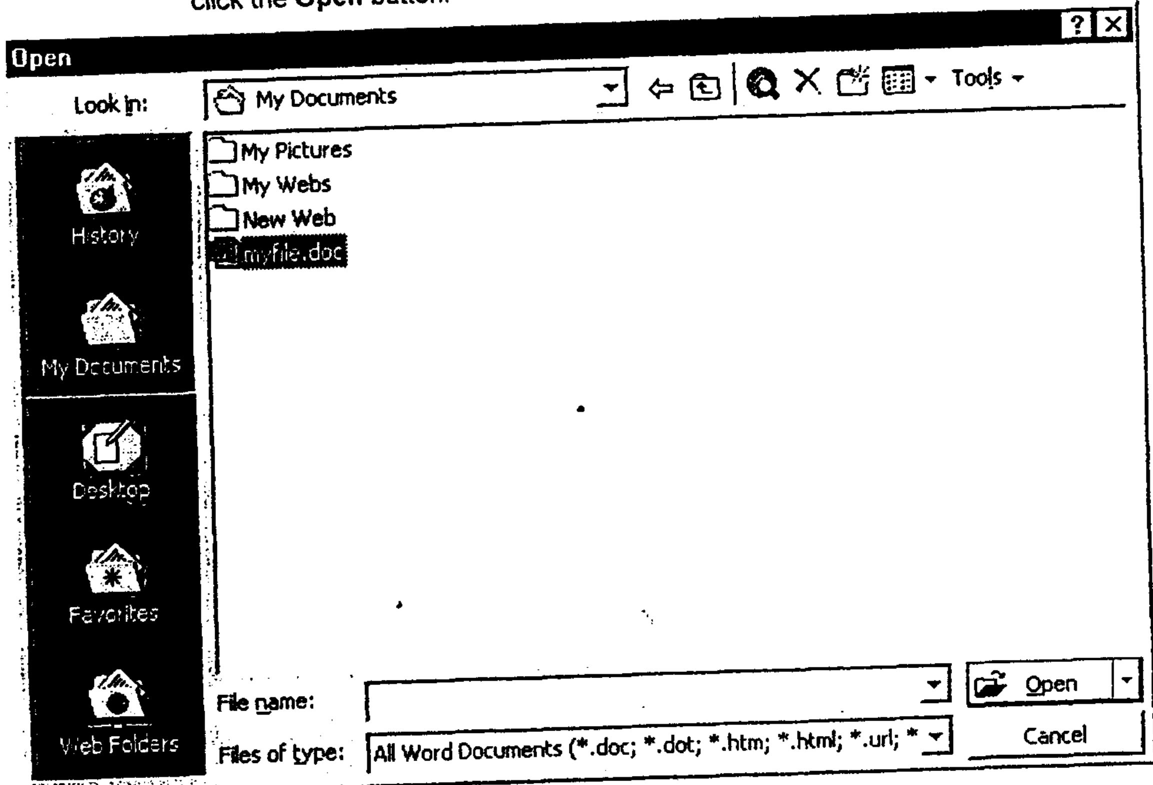
Create a New Document

1. Click the New Document button on the menu bar.
2. Choose **File|New** from the menu bar.
3. Press **CTRL+N** (depress the **CTRL** key while pressing "N") on the keyboard.

Open an Existing Document

1. Click the Open File button on the menu bar.
2. Choose **File|Open** from the menu bar.
3. Press **CTRL+O** on the keyboard.

Each method will show the Open dialog box. Choose the file and click the **Open** button.

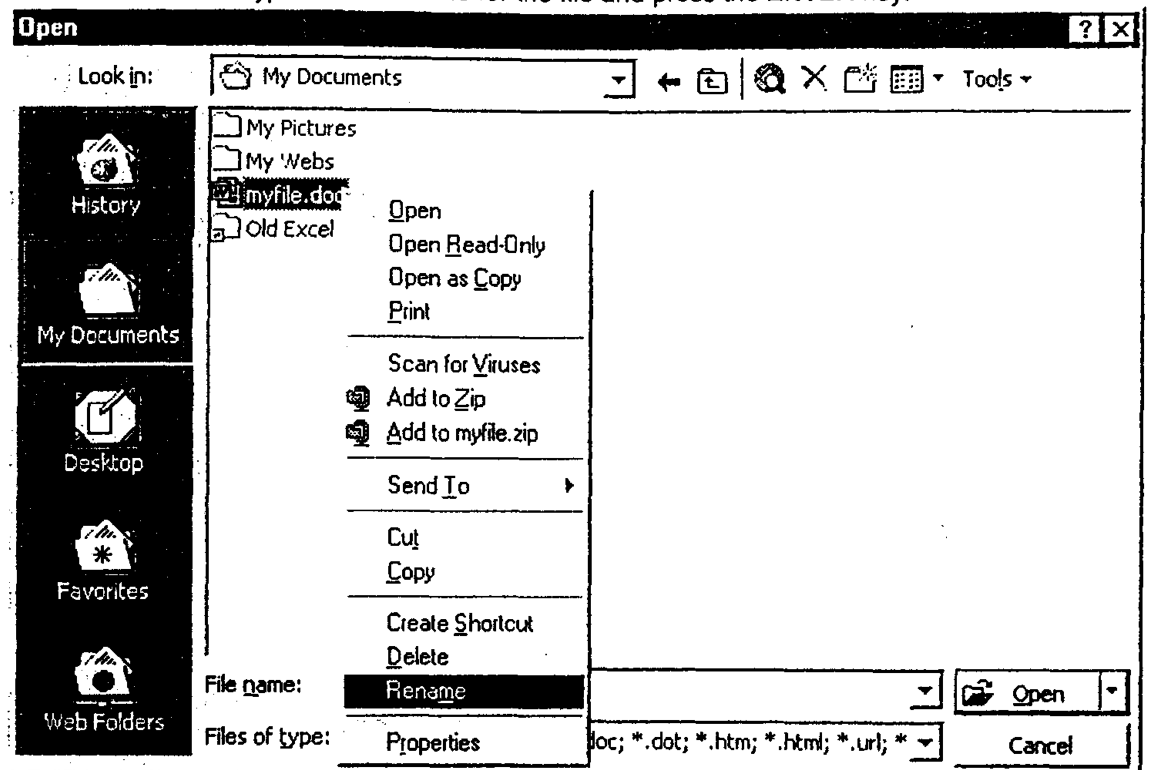


Save a Document

1. Click the Save button on the menu bar.
2. Select **File|Save** from the menu bar.
3. Press **CTRL+S** on the keyboard.

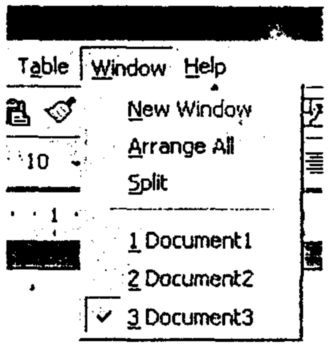
Renaming Documents
To rename a Word document while using the program, select File|Open and find the file you

want to rename. Right-click on the document name with the mouse and select **Rename** from the shortcut menu. Type the new name for the file and press the **ENTER** key.



Working on Multiple Documents

Several documents can be opened simultaneously if you are typing or editing multiple documents at once. All open documents are listed under the **Window** menu as shown below. The current document has a checkmark beside the file name. Select another name to view another open document or click the button on the Windows taskbar at the bottom of the screen.



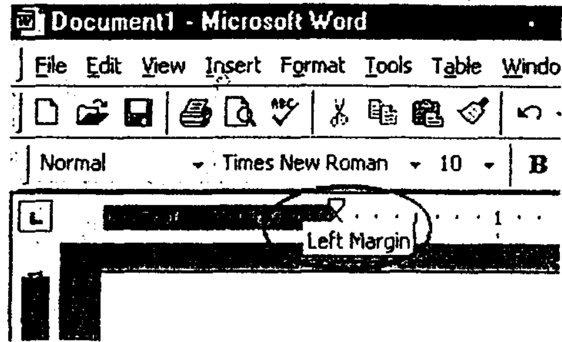
Close a Document

Close the current document by selecting **File|Close** or click the Close icon if it's visible on the Standard Toolbar.

Page Formatting

Page Margins
The page margins of the document can be changed using the rulers on the page and the **Page Setup** window. The ruler method is discussed first:

1. Move the mouse over the area where the white ruler changes to gray.

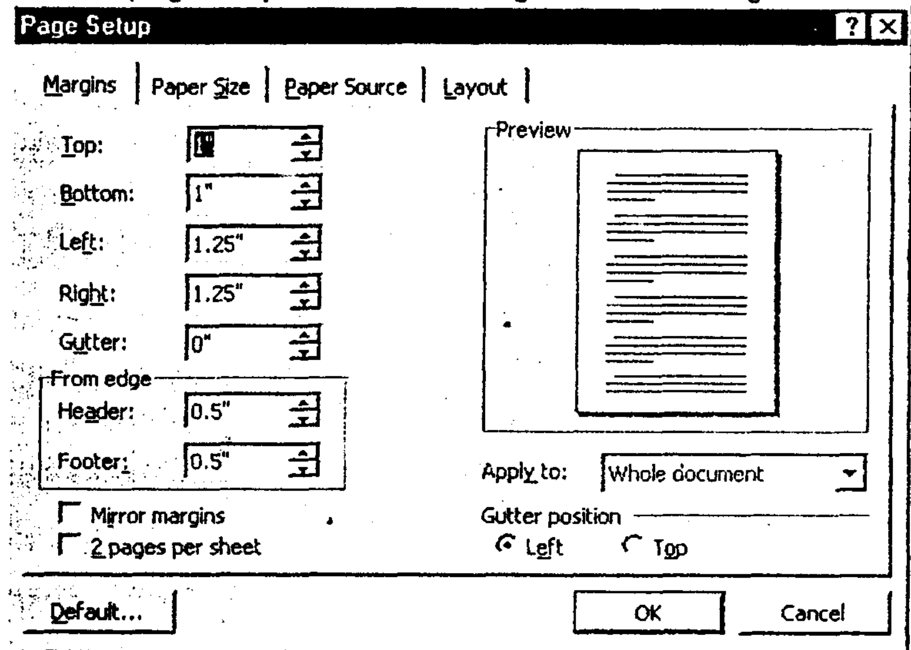


2. When the cursor becomes a double-ended arrow, click with the mouse and drag the margin indicator to the desired location.

3. Release the mouse when the margin is set.

The margins can also be changed using the **Page Setup** dialog box:

1. Select **File|Page Setup** and choose the **Margins tab** in the dialog box.



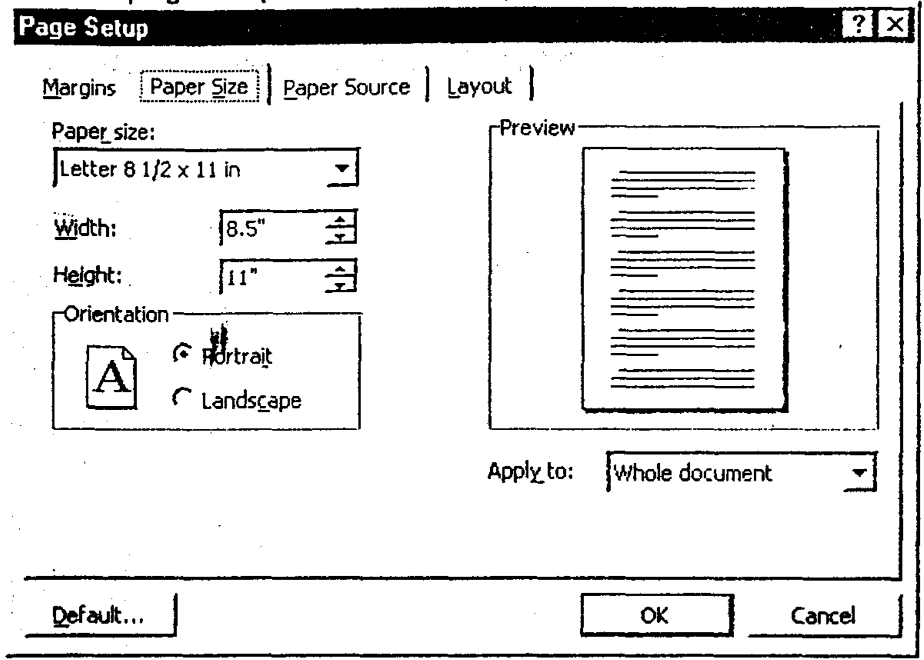
2. Enter margin values in the **Top**, **Bottom**, **Left**, and **Right** boxes. The **Preview** window will reflect the changes.

3. If the document has **Headers** and/or **Footers**, the distance this text appears from the edge of the page can be changed.

4. Click **OK** when finished.

Page Size and Orientation
Change the orientation page within the Page Setup dialog box.

1. Select **File|Page Setup** and choose the **Paper Size** tab.



2. Select the proper paper size from the drop-down menu.

3. Change the orientation from **Portrait** or **Landscape** by checking the corresponding radio button.

Headers and Footers

A header is text that is added to the top margin of every page such as a document title or page number and a footer is text added to the bottom margin. Follow these steps to add or edit headers and footers in the document:

1. Select **View|Header and Footer** from the menu bar. The Header and Footer toolbar will appear and the top of the page will be highlighted as shown below.

2. Type the heading in the **Header** box. You may use many of the standard text formatting options such as font face, size, bold, italics, etc.

3. Click the **Insert AutoText** button to view a list of quick options available.

4. Use the other options on the toolbar to add page numbers, the current date and time.

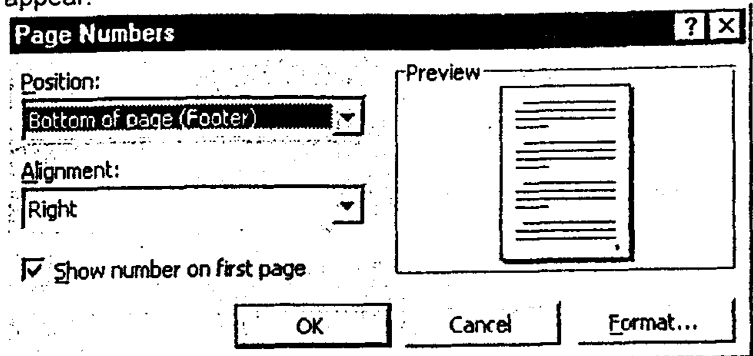
5. To edit the footer, click the **Switch Between Header and Footer button** on the toolbar.

6. When you are finished adding headers and footers, click the **Close button** on the toolbar.

Page Numbers

Follow these instructions for another way to add page numbers to a document.

1. Select **Insert|Page Numbers** from the menu bar and the following dialog box will appear.



2. Select the position of the page numbers by choosing "Top of page" or "Bottom of page" from the **Position** drop-down menu.

3. Select the alignment of the page numbers in the **Alignment** drop-down menu.

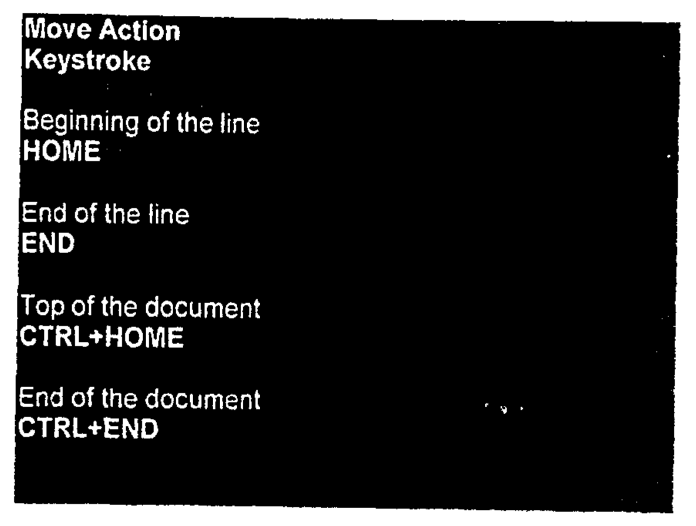
4. If you do not want tne page number to show on the first page (if it is a title page, for example), uncheck.the **Show number of first page** box.

5. Click **OK** when finished.

Print Preview and Printing
Preview your document by clicking the Print Preview button on the standard toolbar or by selecting **File|Print Preview**. When the document is ready to print, click the Print button from the Print Preview screen or select **File|Print**

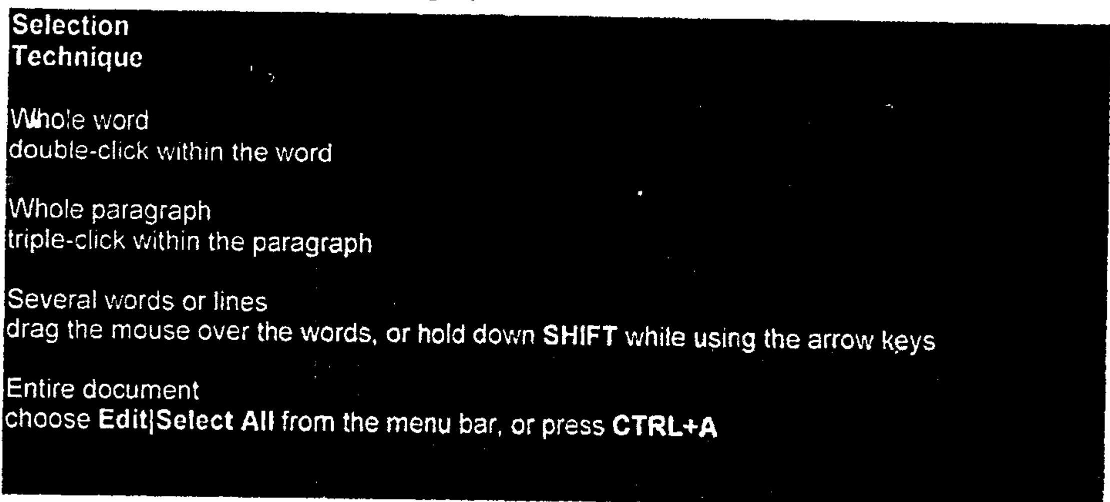
Working With Text

Typing and Inserting Text
To enter text, just start typing! The text will appear where the blinking cursor is located. Move the cursor by using the arrow buttons on the keyboard or positioning the mouse and clicking the left button. The keyboard shortcuts listed below are also helpful when moving through the text of a document:



Move Action	Keystroke
Beginning of the line	HOME
End of the line	END
Top of the document	CTRL+HOME
End of the document	CTRL+END

Selecting Text
To change any attributes of text it must be highlighted first. Select the text by dragging the mouse over the desired text while keeping the left mouse button depressed, or hold down the **SHIFT** key on the keyboard while using the arrow buttons to highlight the text. The following table contains shortcuts for selecting a portion of the text:

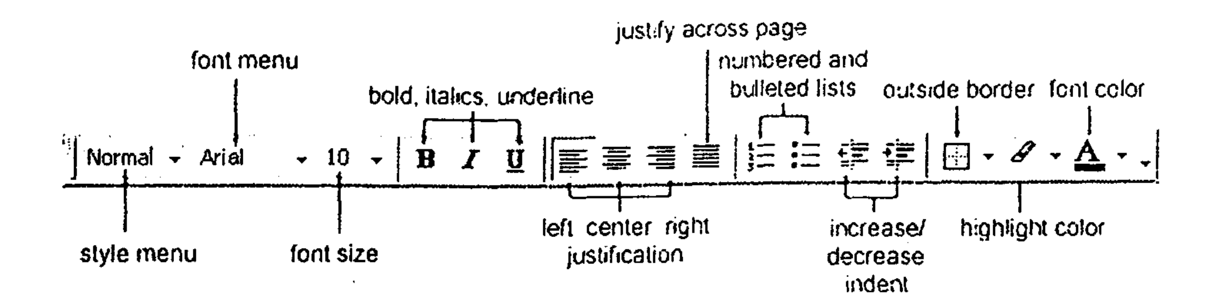


Selection	Technique
Whole word	double-click within the word
Whole paragraph	triple-click within the paragraph
Several words or lines	drag the mouse over the words, or hold down **SHIFT** while using the arrow keys
Entire document	choose **Edit|Select All** from the menu bar, or press **CTRL+A**

Deselect the text by clicking anywhere outside of the selection on the page or press an arrow key on the keyboard.

Deleting text
Use the **BACKSPACE** and **DELETE** keys on the keyboard to delete text. Backspace will delete text to the left of the cursor and Delete will erase text to the right. To delete a large selection of text, highlight it using any of the methods outlined above and press the **DELETE** key.

Formatting Text
The formatting toolbar is the easiest way to change many attributes of text. If the toolbar as shown below isn't displayed on the screen, select **View|Toolbars** and choose **Formatting.**



- **Style Menu** - Styles are explained in detail later in this tutorial.

- **Font Face** - Click the arrowhead to the right of the font name box to view the list of fonts available. Scroll down to the font you want and select it by clicking on the name once with the mouse. A serif font (one with "feet" circled in the illustration below) is recommended for paragraphs of text that will be printed on paper as they are most readable. The following graphic demonstrates the difference between ***serif*** (Times New Roman on the left) and ***sans-serif*** ("no feet", Arial on the right) fonts.

  T T

- **Font Size** - Click on the white part of the font size box to enter a value for the font size or click the arrowhead to the right of the box to view a list of font sizes available. Select a size by clicking on it once. A font size of 10 or 12 is best for paragraphs of text.

- **Font Style** - Use these buttons to bold, italicize, and underline text.

- **Alignment** - Text can be aligned to the left, center, or right side of the page or it can be justified across the page.

- **Numbered and Bulleted Lists** - Lists are explained in detail later in this tutorial.

- **Increase/Decrease Indent** - Change the indentation of a paragraph in relation to the side of the page.

- **Outside Border** - Add a border around a text selection.

- **Highlight Color** - Use this option to change the color behind a text selection. The color shown on the button is the last color used. To select a different color, click the arrowhead next to the image on the button.

- **Text Color** - This option changes the color of the text. The color shown on the button is the last color chosen. Click the arrowhead next to the button image to select another color.

  The **Font** dialog box allows you to choose from a larger selection of formatting options. Select **Format|Font** from the menu bar to access the box.

Font

Font | Character Spacing | Text Effects

Font: Times New Roman
Stencil
Symbol
Tahoma
Tempus Sans ITC
Times New Roman

Font style: Regular
Regular
Italic
Bold
Bold Italic

Size: 10
8
9
10
11
12

Font color: Automatic
Underline style: (none)
Underline color: Automatic

Effects
Strikethrough
Double strikethrough
Superscript
Subscript
Shadow
Outline
Emboss
Engrave
Small caps
All caps
Hidden

Preview
Times New Roman

This is a TrueType font. This font will be used on both printer and screen.

Default... OK Cancel

Format Painter

A handy feature for formatting text is the **Format Painter** located on the standard toolbar. For example, if you have formatting a paragraph heading with a certain font face, size, and style and you want to format another heading the same way, you do not need to manually add each attribute to the new headline. Instead, use the Format Painter by following these steps:

1. Place the cursor within the text that contains the formatting you want to copy.
2. Click the **Format Painter** button in the standard toolbar. Notice that your pointer now has a paintbrush beside it.
3. Highlight the text you want to add the same format to with the mouse and release the mouse button.

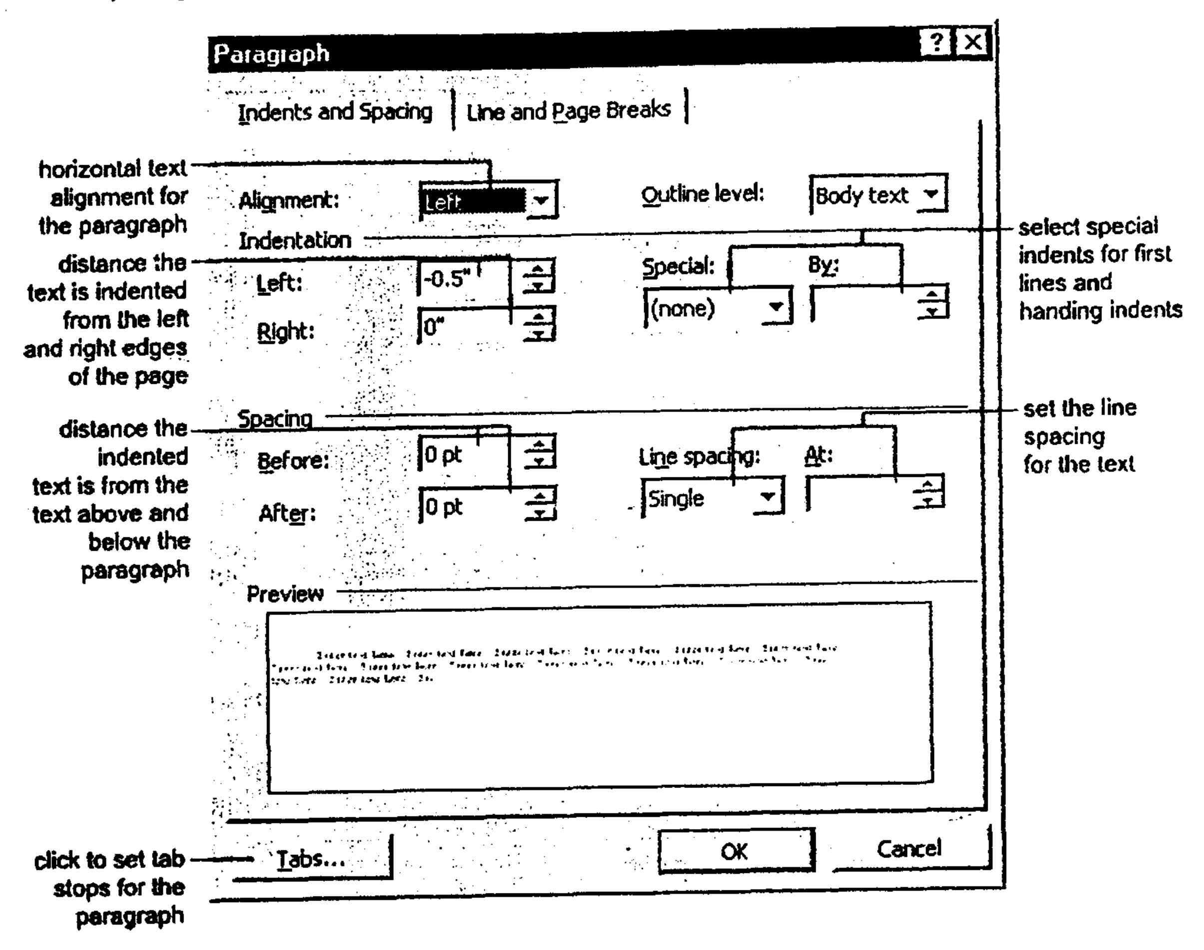
To add the formatting to multiple selections of text, double-click the **Format Painter** button instead of clicking once. The format painter then stays active until you press the **ESC** key to turn it off.

Undo

Feel free to experiment with various text styles. You can always undo your last action by clicking the **Undo** button on the standard toolbar or selecting **Edit|Undo...** from the menu bar. Click the **Redo** button on the standard toolbar or select **Edit|Redo...** to erase the undo action

Formatting Paragraphs

Paragraph Attributes
Format a paragraph by placing the cursor within the paragraph and selecting **Format|Paragraph** from the menu bar.



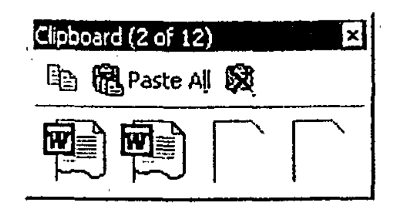
Moving (Cutting) Text
Highlight the text that will be moved and select **Edit|Cut** from the menu bar, click the **Cut** button on the standard tool bar, or press **CTRL+X** at once. This will move the text to a clipboard.

To move a small amount of text a short distance, the drag-and-drop method may be quicker. Highlight the text you want to move, click the selection with the mouse, drag the selection to the new location, and release the mouse button.

Copying Text
To copy text, choose **Edit|Copy**, click the **Copy** button on the standard toolbar, or press **CTRL+C** to copy the text to the clipboard.

Paste Text
To paste cut or copied text, move the cursor to the location you want to move the text to and select **Edit|Paste** from the menu bar, click the **Paste** button on the standard toolbar, or press **CTRL+V**.

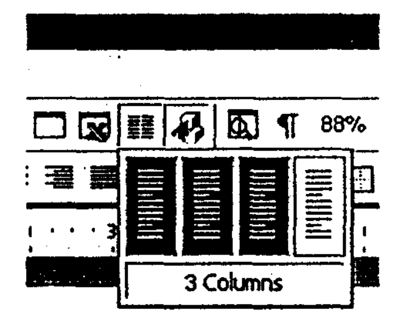
The Clipboard
The last 12 elements that were cut or copied are placed onto Word's clipboard. You can view the elements on the clipboard by selecting **View|Toolbars|Clipboard** from the menu bar.



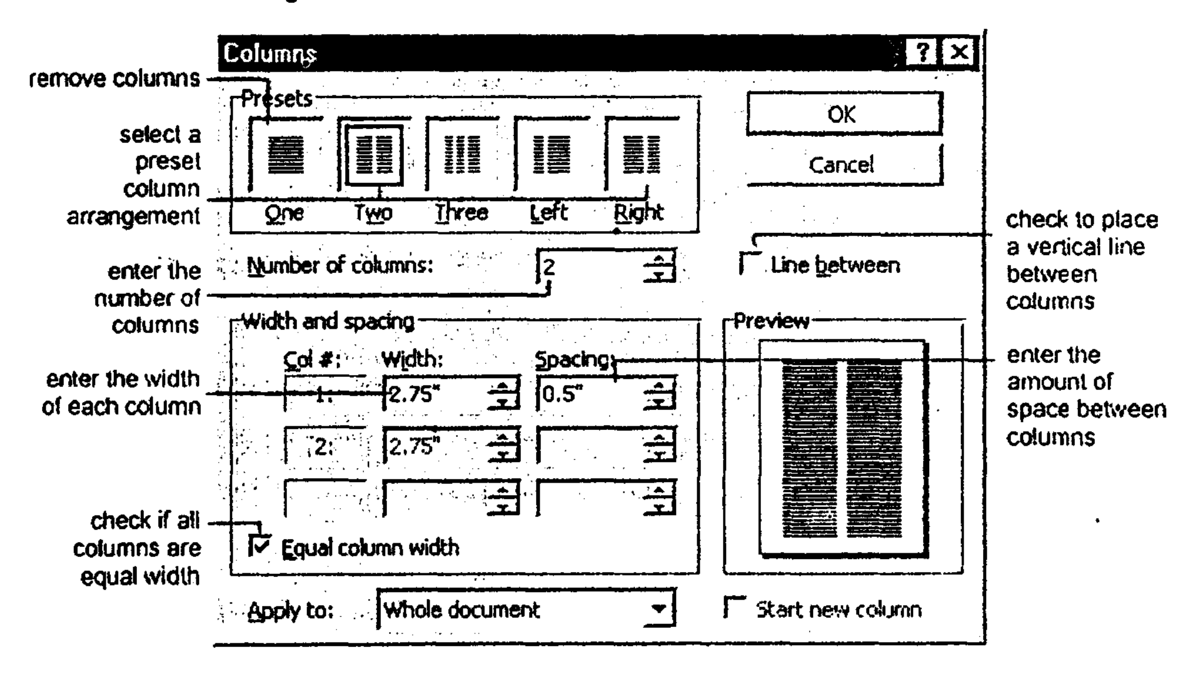
Place the mouse arrow over each element in the clipboard to view the contents of each item and click on an element to add its contents to the document. Click **Paste All** to add all of the items to the document at once. Click the **Clear Clipboard** button (the icon with an "X" over the clipboard image) to clear the contents of the clipboard.

Columns

To quickly place text in a column format, click the **Columns** button on the standard toolbar and select the number of columns by dragging the mouse over the diagram.

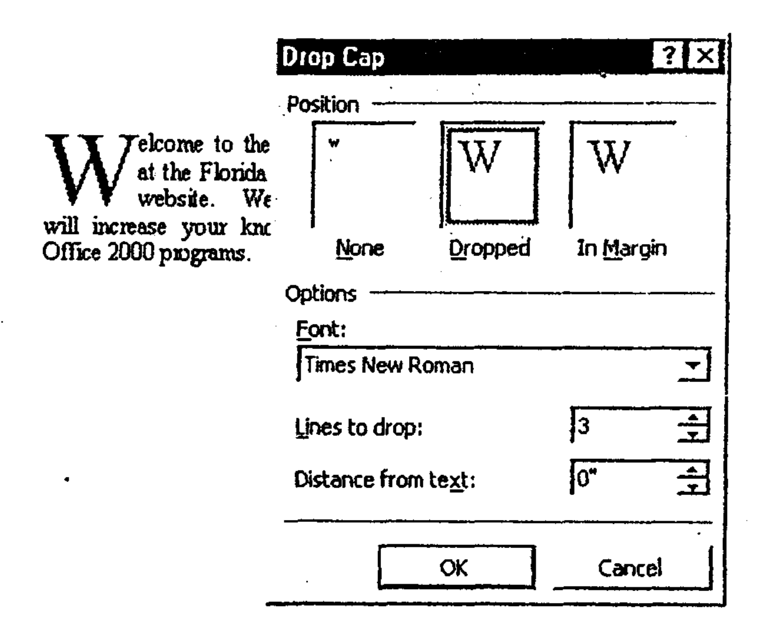


For more column options, select **Format|Columns** from the menu bar. The **Columns** dialog box allows you to choose the properties of the columns. Select the number and width of the columns from the dialog box.



Drop Caps

A drop cap is a large letter that begins a paragraph and drops through several lines of text as shown below.

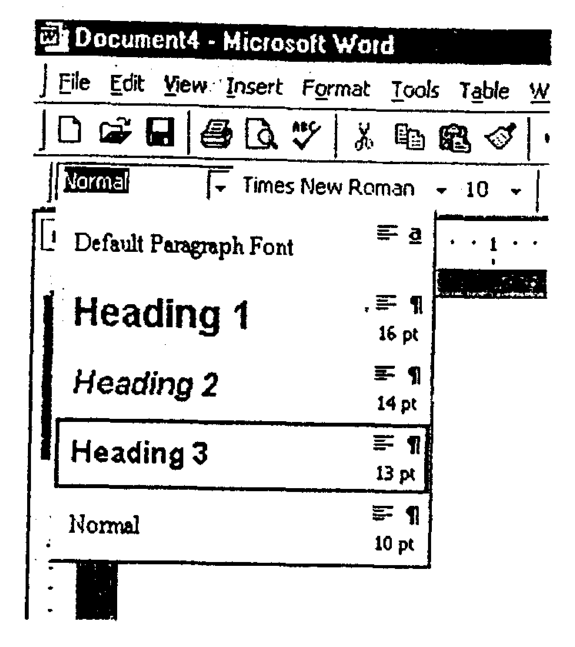


Add a drop cap to a paragraph by following these steps:

1. Place the cursor within the paragraph whose first letter will be dropped.
2. Select **Format|Drop Cap** from the menu bar.
3. The **Drop Cap** dialog box allows you to select the position of the drop cap, the font, the number of lines to drop, and the distance from the body text.
4. Click **OK** when all selections have been made.
5. To modify a drop cap, select **Format|Drop Cap** again to change the attributes, or click on the letter and use the handles to move and resize the letter.

Styles

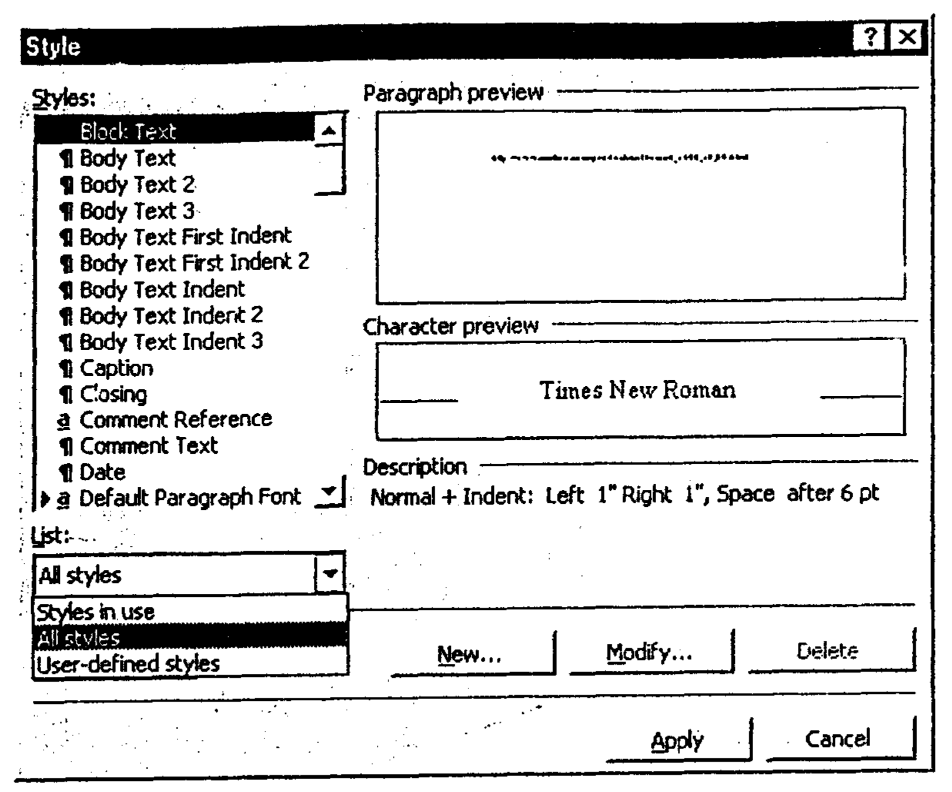
The use of styles in Word will allow you to quickly format a document with a consistent and professional look. Paragraph and character styles can be saved for use in many documents.



Applying a Style

1. Place the cursor in the paragraph where the style will be applied.
2. Click the **Style** drop-down menu on the Formatting toolbar and select a style by clicking on it.
3. To apply the same style to multiple paragraphs, double click the **Format Painter** button on the standard toolbar and click in all the paragraphs that the style should be applied to. Press the **ESC** key to disable the Format Painter.

Apply a Style from the Style Dialog Box
Choose from a larger selection of styles from the **Style** dialog box.

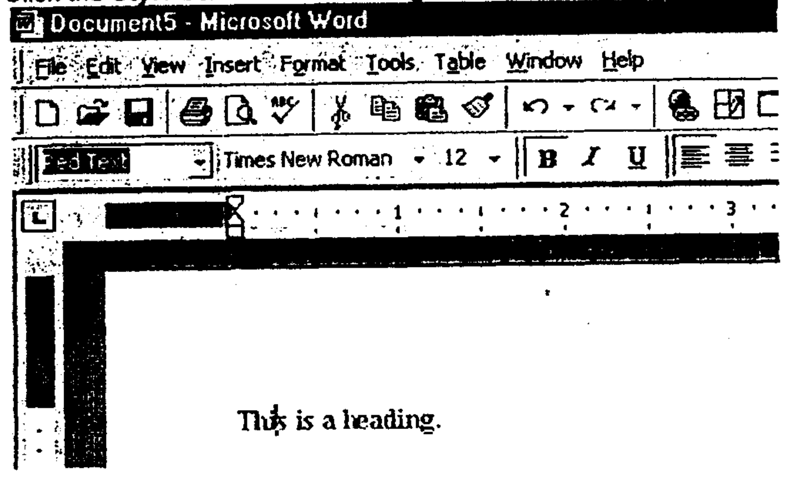


1. Click in the paragraph you want to add a style to.
2. Select **Format|Style...** from the menu bar.
3. From the **List** drop-down menu, choose **All styles** to view all the styles available.
4. The styles are displayed in the **Styles** list. Preview each style by clicking once on the name. Paragraph styles are preceded by the paragraph symbol (¶) and character styles are preceded by an "a" icon (a). A pointer arrow is located next to the current style. Highlight the style you want to apply to the paragraph and click **Apply**.

Create a New Style from a Model

To create a style from text that is already formatted in a document, follow these steps:

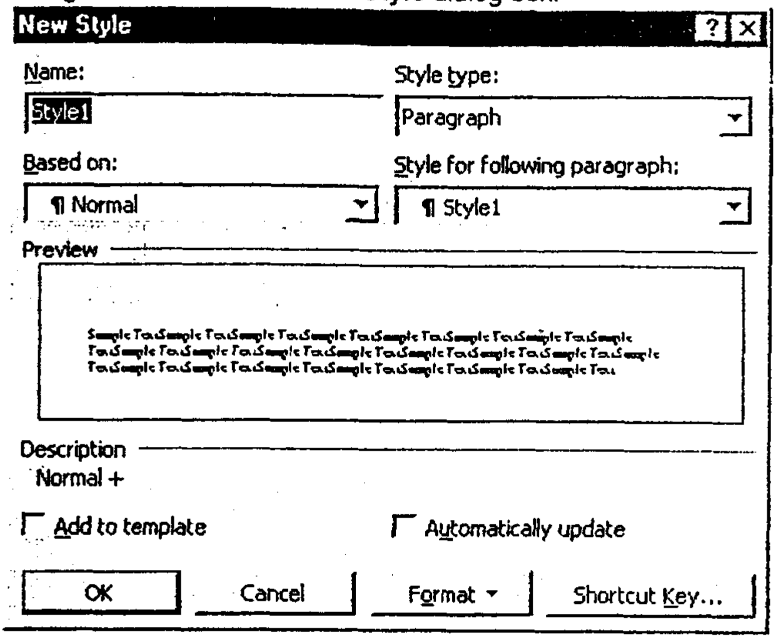
1. Place the cursor in the paragraph you would like to set as a new style.
2. Click the **Style** box on the formatting toolbar so the style name is highlighted.



3. Delete the text in the field and type the name of the new style.
4. Press the **ENTER** key to save the new style.

Create a Simple Style from the Style Dialog Box

1. Select **Format|Style...** from the menu bar and click the New button on the **Style** dialog box to access the **New Style** dialog box.



2. Type the name for the new style in the **Name** field.

3. Select "Paragraph" or "Character" from the **Style type** drop-down menu.

4. Click the **Format** button at the bottom of the window and choose the paragraph element that will be formatted for the style. Continue to make changes from the options from the Format button menu, making changes to the dialog boxes for each element you choose.

5. Click **OK** to set the style and close the **New Style** dialog box.

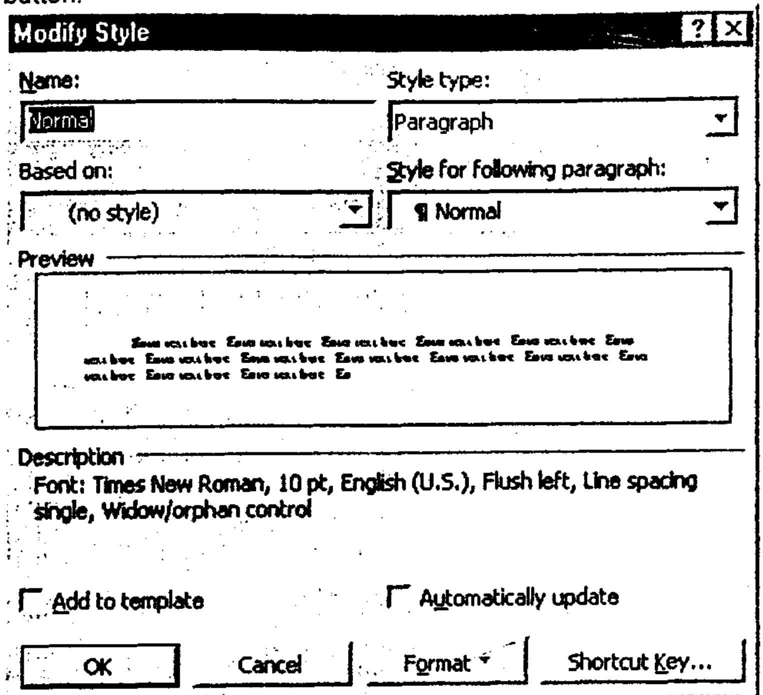
6. Click **Apply** on the **Style** dialog box to apply the new style to the current paragraph.

Modify or Rename a Style

An existing style can be changed from the Style dialog box.

1. Select **Format|Style...** from the menu bar.

2. Highlight the style from the **Styles** list that you want to modify and click the **Modify** button.



3. Use the same methods to modify the style from the **Modify Style** dialog box that were used for the New Style box.

4. To only rename the style, type a new name in the **Name** field.

5. Click **OK** when you are finished making modifications.

6. Click **Apply** to update the style in the document.

Delete a Style

Preset styles created by Word cannot be deleted, but to delete a style you have made, follow these steps:

1. Select **Format|Style...** from the menu bar

2. Highlight the style from the **Styles** list that you want to delete.

3. Click the **Delete** button.

4. You will be asked if you really want to delete the style. Click **Yes**.

5. Click **Close** on the dialog box.

Lists

To create a bulleted or numbered list, use the list features provided by Word.

Bulleted and Numbered Lists

1. Click the **Bulleted List** button or **Numbered List** button on the formatting toolbar.
2. Type the first entry and press **ENTER**. This will create a new bullet or number on the next line. If you want to start a new line without adding another bullet or number, hold down the **SHIFT** key while pressing **ENTER**.
3. Continue to typing entries and press **ENTER** twice when you are finished typing to end the list.

Use the **Increase Indent** and **Decrease Indent** buttons on the formatting toolbar to create lists of multiple levels.

NOTE: You can also type the text first, highlight the section, and press the **Bulleted List** or **Numbered List** buttons to add the bullets or numbers.

Nested Lists

To create a nested list, such as a numbered list inside of a bulleted list, follow these steps:

1. Type the list and increase the indentation of the items that will make up the nested list by clicking the **Increase Indent** button for each item.

- Lists
    - o Bulleted and Numbered Lists
    - o Nested Lists
    - o Formatting Lists
- Tables
    - o Create a Table

- Lists
    1. Bulleted and Numbered Lists
    2. Nested Lists
    3. Formatting Lists
- Tables
    - o Create a Table

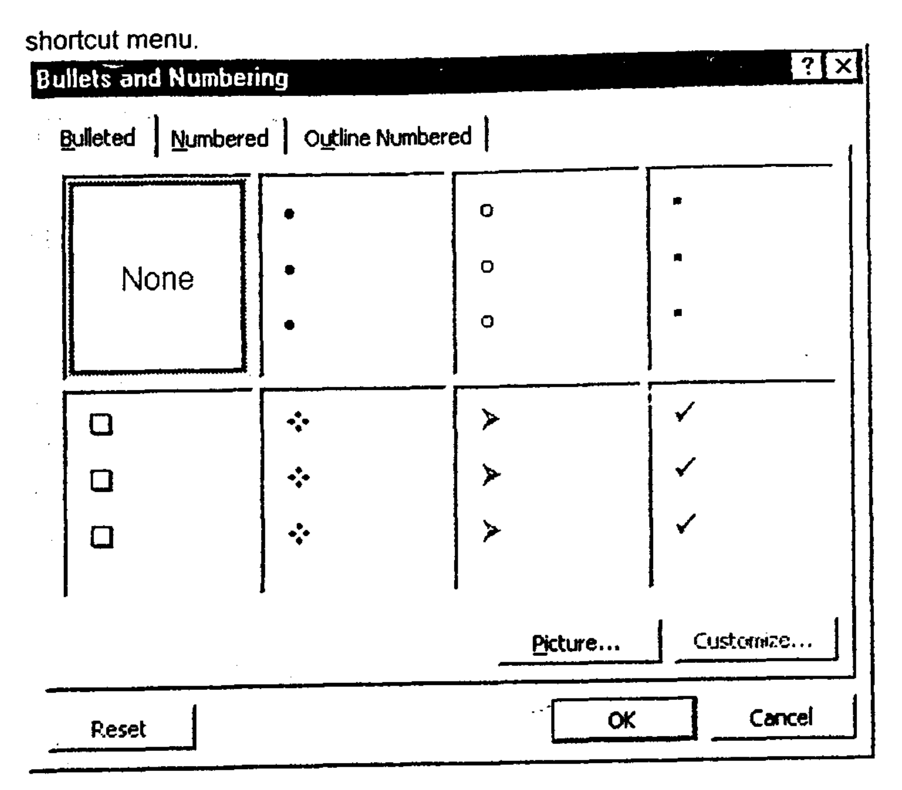
2. Highlight the items and click the **Numbered List** button on the formatting toolbar.

Formatting Lists

The bullet image and numbering format can be changed by using the **Bullets and Numbering** dialog box.

1. Highlight the entire list to change all the bullets or numbers, or
   Place the cursor on one line within the list to change a single bullet.
2. Access the dialog box by selecting **Format|Bullets and Numbering** from the menu bar or by right-clicking within the list and selecting **Bullets and Numbering** from the

shortcut menu.



3. Select the list style from one of the seven choices given, or click the **Picture...** button to choose a different icon. Click the **Numbered** tab to choose a numbered list style.

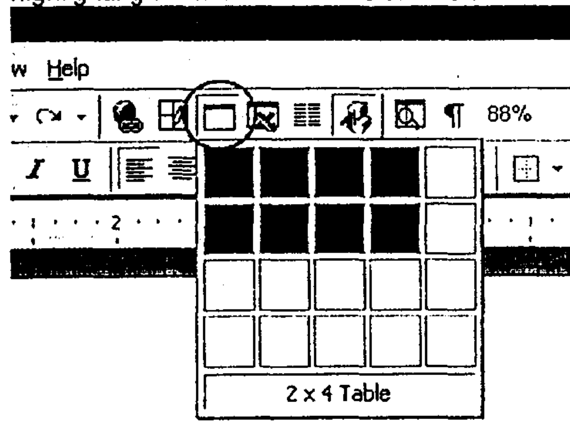
4. Click **OK** when finished.

Tables

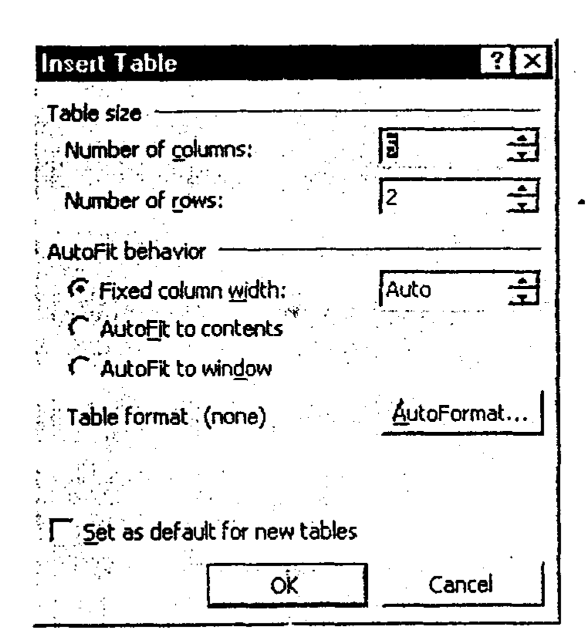
Tables are used to display data and there are several ways to build them in Word. Begin by placing the cursor where you want the table to appear in the document and choose one of the following methods.

Insert a Table
There are two ways to add a table to the document using the Insert feature:

1. Click the **Insert Table** button on the standard toolbar. Drag the mouse along the grid, highlighting the number of rows and columns for the table.

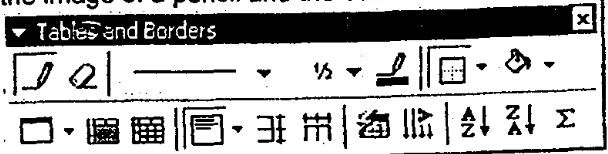


2. Or, select **Table|Insert|Table** from the menu bar. Select the number of rows and columns for the table and click **OK**.



Draw the Table
A table can also be drawn onto the document:

1. Draw the table by selecting **Table|Draw Table** from the menu bar. The cursor is now the image of a pencil and the **Tables and Borders** toolbar has appeared.



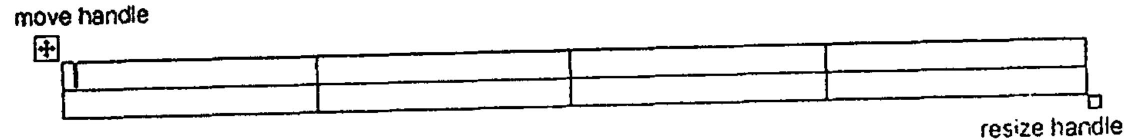
2. Draw the cells of the table with the mouse. If you make a mistake, click the **Eraser** button and drag the mouse over the area to be deleted.

3. To draw more cells, click on the **Draw Table** button .

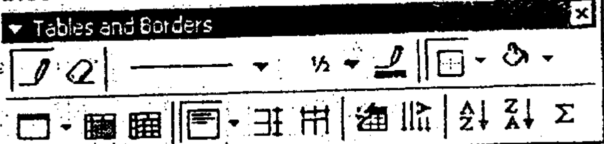
Inserting Rows and Columns
Once the table is drawn, insert additional rows by placing the cursor in the row you want to be adjacent to. Select **Table|Insert|Rows Above** or **Rows Below**. Or, select an entire row and right-click with the mouse. Choose **Insert Rows** from the shortcut menu.

Much like inserting a row, add a new column by placing the cursor in a cell adjacent to where the new column will be added. Select **Table|Insert|Columns to the Left** or **Columns to the Right**. Or, select the column, right-click with the mouse, and select **Insert Columns**.

Moving and Resizing a Table
A four-sided moving arrow and open box resizing handle will appear on the corners of the table if the mouse is placed over the table. Click and drag the four-ended arrow to move the table and release the mouse button when the table is positioned where you want it. Click and drag the open box handle to resize the table. Change the column widths and row heights by clicking the cell dividers and dragging them with the mouse.



Tables and Borders Toolbar
The Tables and Borders toolbar allows you to add border styles, shading, text effects, alignment, and more options to your table. Access the toolbar by clicking **Table|Draw Table** or **View|Toolbars|Tables and Borders**.



You will need to highlight the cells of the table you want to format. Click and drag the mouse over the cells, or use the following shortcuts:

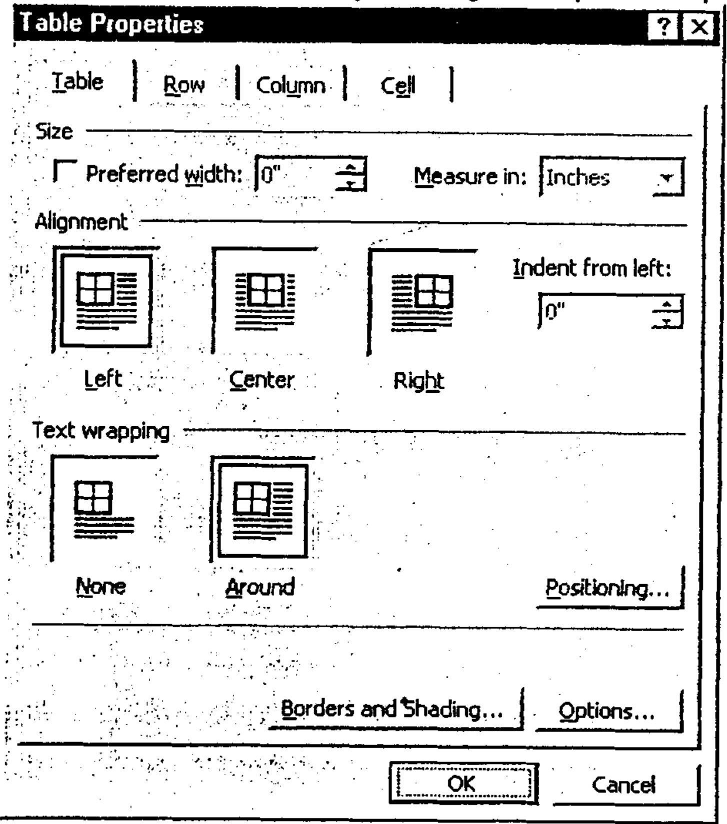
Selection	Menu Method	Mouse Method
One cell	**Table|Select|Cell**	Click the bottom, left corner of the cell when a black arrow appears
One row	**Table|Select|Row**	Click outside the table to the left of the row
One column	**Table|Select|Column**	Click outside the table above the column when a black arrow appears
Several rows		

(none)
Click outside the table to the left of the row and drag the mouse down

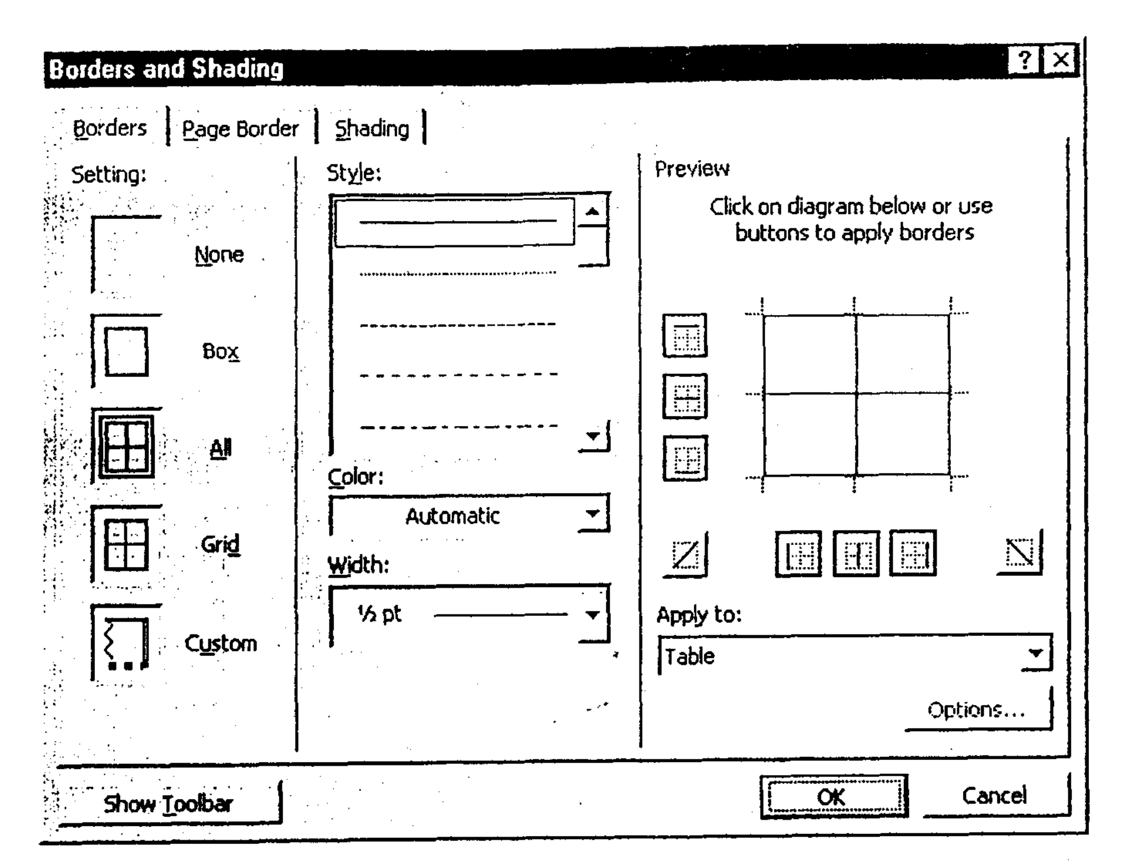
Several columns
(none)
Click outside the table above the column

Entire table
Table|Select|Table
Triple-click to the left of the table

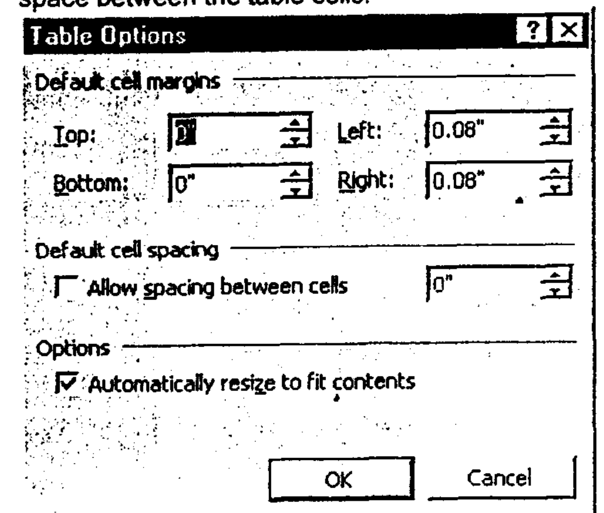
Table Properties
Use the **Table Properties** dialog box to modify the alignment of the table with the body text and the text within the table. Access the box by selecting **Tables|Table Properties**.



- **Size** - Check the **Preferred width** box and enter a value if the table should be an exact width.
- **Alignment** - Highlight the illustration that represents the alignment of the table in relation to the text of the document.
- **Text wrapping** - Highlight "None" if the table should appear on a separate line from the text or choose "Around" if the text should wrap around the table.
- **Borders and Shading** - Select from a number of border styles, colors, and widths. Click the **Shading** tab to change the background color and pattern.



- **Options** - Click the **Options** button on the **Table Properties** window. To change the spacing between the document text and the table borders under **Default cell margins**. Check the **Allow spacing between cells** box and enter a value to add space between the table cells.



Adding Graphics

Adding Clip Art
To add a clip art image from the Microsoft library to a document, follow these steps:

1. Select **Insert|Picture|Clip Art** from the menu bar.

Insert ClipArt

Import Clips | Clips Online | Help

Search for clips: Type one or more words. . .

Pictures | Sounds | Motion Clips

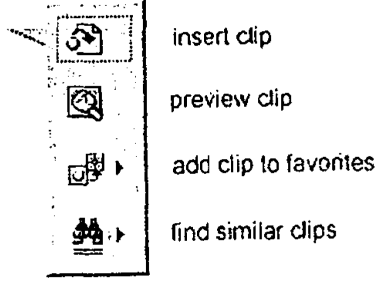
Categories 1 - 51

New Category | Favorites | Academic | Animals | Backgrounds

Borders & Frames | Buildings | Business | Buttons & Icons | Cartoons

2. To find an image, click in the white box following **Search for clips**. Delete the words "Type one or more words. . ." and enter keywords describing the image you want to use.
   - OR -
   Click one of the category icons.

3. Click once on the image you want to add to the document and the following popup menu will appear:



   - **Insert Clip** to add the image to the document.
   - **Preview Clip** to view the image full-size before adding it to the document. Drag the bottom, right corner of the preview window to resize the image and

click the "x" close button to end the preview.

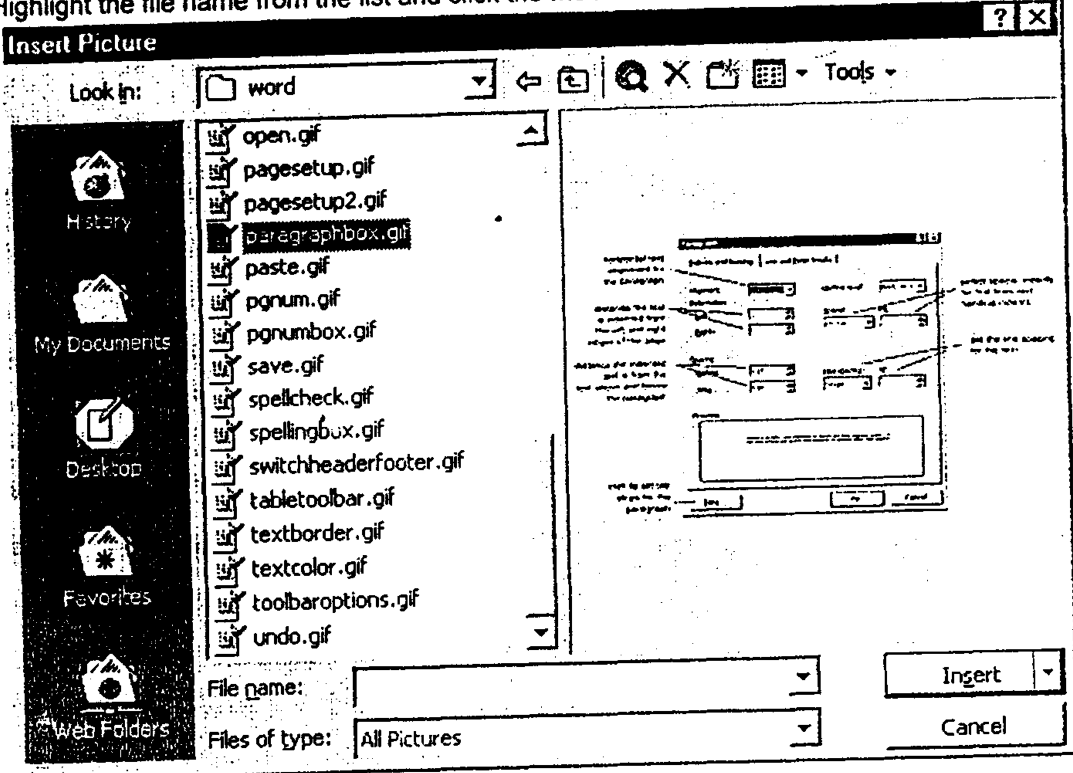


- **Add Clip to Favorites** will add the selected image to your favorites directory that can be chosen from the **Insert ClipArt** dialog box.
- **Find Similar Clips** will retrieve images similar to the one you have chosen.

4. Continue selecting images to add to the document and click the **Close** button in the top, right corner of the **Insert ClipArt** window to stop adding clip art to the document.

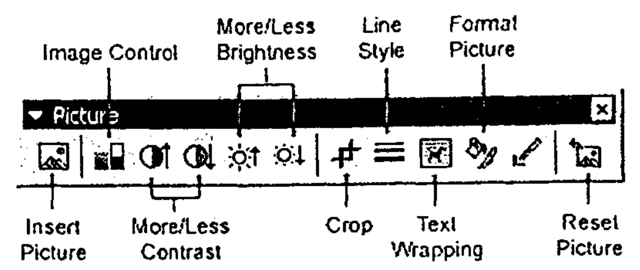
Add An Image from a File
Follow these steps to add a photo or graphic from an existing file:

1. Select **Insert|Picture|From File** on the menu bar.
2. Click the down arrow button on the right of the **Look in:** window to find the image on your computer.
3. Highlight the file name from the list and click the **Insert** button.



Editing A Graphic
Activate the image you wish to edit by clicking on it once with the mouse. Nine handles will appear around the graphic. Click and drag these handles to resize the image. The handles on

the corners will resize proportionally while the handles on the straight lines will stretch the image. More picture effects can be changed using the Picture toolbar. The **Picture toolbar** should appear when you click on the image. Otherwise, select **View|Toolbars|Picture** from the menu bar to activate it.



- **Insert Picture** will display the image selection window and allows you to change the image.

- **Image Control** allows to to make the image grayscale, black and white, or a watermark.

- **More/Less Contrast** modifies the contrast between the colors of the image.

- **More/Less Brightness** will darken or brighten the image.

- Click **Crop** and drag the handles on the activated image to delete outer portions of the image.

- **Line Style** will add a variety of borders to the graphic.

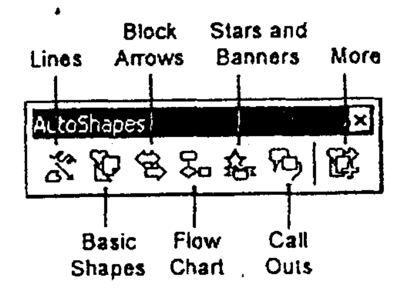
- **Text Wrapping** will modify the way the document text wraps around the graphic.

- **Format Picture** displays all the image properties in a separate window.

- **Reset Picture** will delete all the modifications made to the image.

Auto Shapes

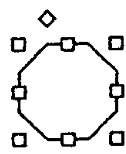
The AutoShapes toolbar will allow you to draw many different geometrical shapes, arrows, flow chart symbols, stars, and banners on the document. Activate the AutoShapes toolbar by selecting **Insert|Picture|AutoShapes** or **View|Toolbars|AutoShapes** from the menu bar, or clicking the **AutoShapes** button on the Drawing toolbar. Click each button on the toolbar to view the options for drawing the shape.



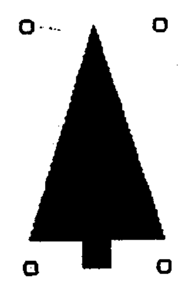
- **Lines** - After clicking the Lines button on the AutoShapes toolbar, draw a ***straight line, arrow***, or ***double-ended arrow*** from the first row of options by clicking the respective button. Click in the document where you would like the line to begin and click again where it should end. To draw a ***curved line*** or ***freeform shape***, select curved lines from the menu (first and second buttons of second row), click in the

document where the line should appear, and click the mouse every time a curve should begin. End creating the graphic by clicking on the starting end or pressing the **ESC** key. To ***scribble***, click the last button in the second row, click the mouse in the document and hold down the left button while you draw the design. Let go of the mouse button to stop drawing.

- **Basic Shapes** - Click the Basic Shapes button on the AutoShapes toolbar to select from many ***two- and three-dimensional shapes***, ***icons***, ***braces***, and ***brackets***. Use the drag-and-drop method to draw the shape in the document. When the shape has been made, it can be resized using the open box handles and other adjustments specific to each shape can be modified using the yellow diamond handles.



- **Block Arrows** - Select Block Arrows to choose from many types of ***two- and three-dimensional arrows***. Drag-and-drop the arrow in the document and use the open box and yellow diamond handles to adjust the arrowheads. Each AutoShape can also be rotated by first clicking the **Free Rotate** button on the drawing toolbar. Click and drag the green handles around the image to rotate it. The tree image below was created from an arrow rotated 90 degrees.



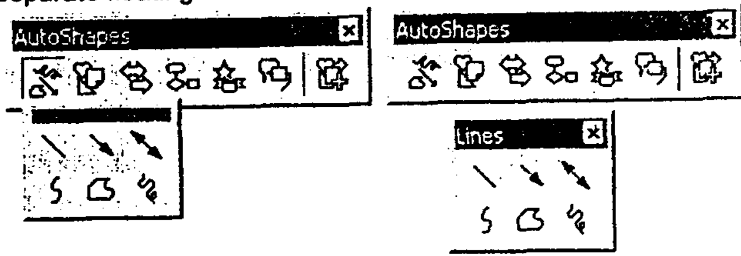
- **Flow Chart** - Choose from the flow chart menu to add ***flow chart elements*** to the document and use the line menu to draw connections between the elements.

- **Stars and Banners** - Click the button to select ***stars***, ***bursts***, ***banners***, and ***scrolls***.

- **Call Outs** - Select from the ***speech and thought bubbles***, and ***line call outs***. Enter the call out text in the text box that is made.

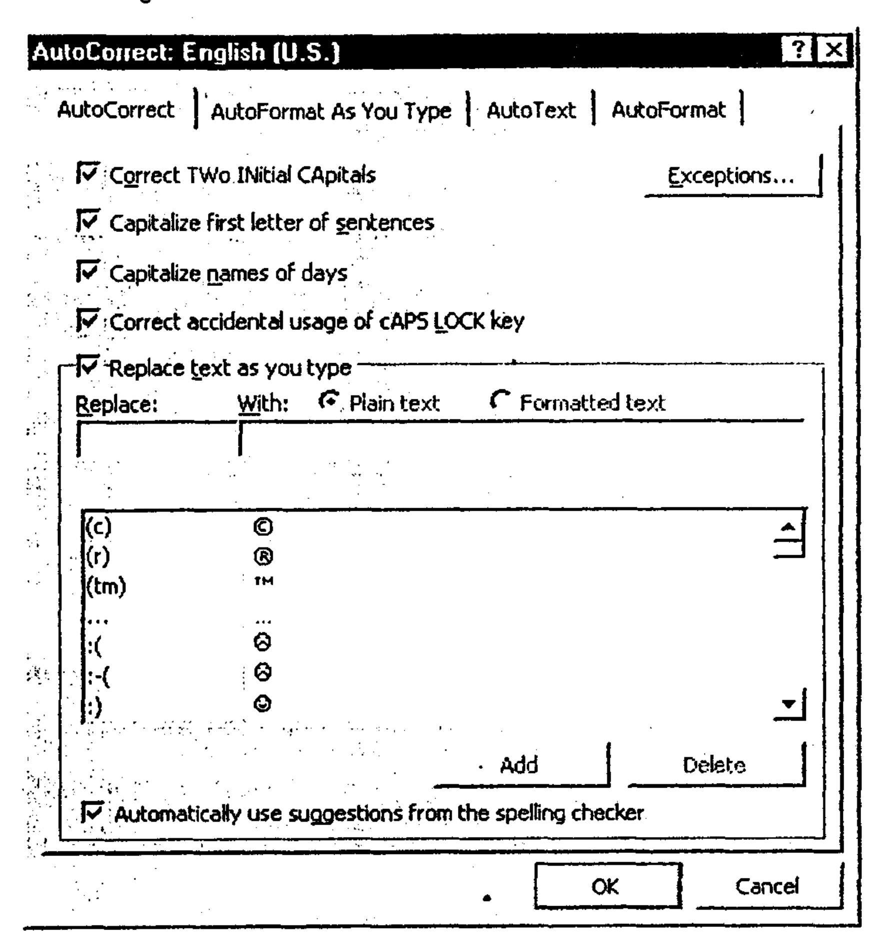
- **More AutoShapes** - Click this button to choose from a list of clip art categories.

Each of the submenus on the AutoShapes toolbar can become a separate toolbar. Just click and drag the gray bar across the top of the submenus off of the toolbar and it will become a separate floating toolbar.



Spelling and Grammar

AutoCorrect
Word automatically corrects many commonly misspelled words and punctuation marks with the AutoCorrect feature. To view the list of words that are automatically corrected, select **Tools|AutoCorrect**. This may be a hidden feature so click the double arrows at the bottom of the **Tools** menu listing if the AutoCorrect choice is not listed.



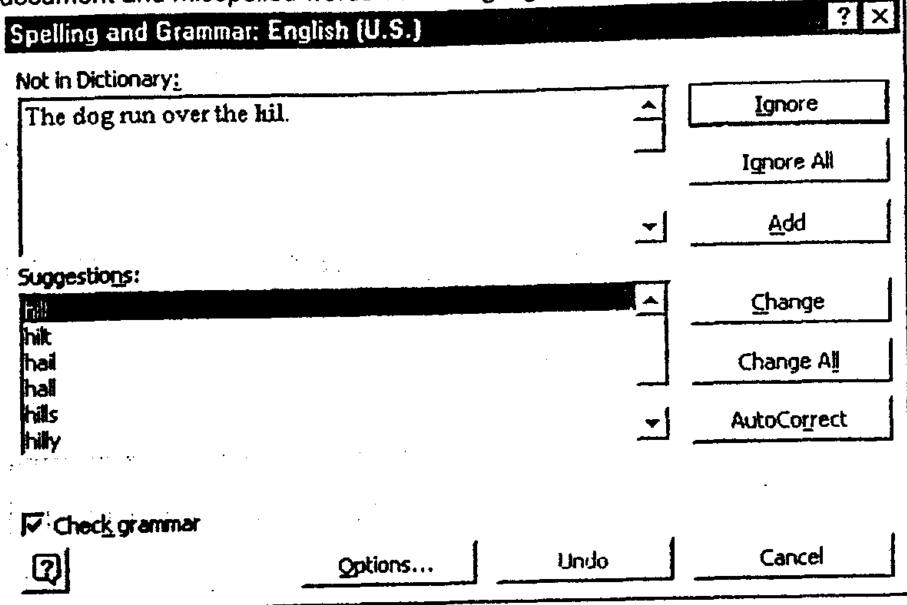
Many options including the accidental capitalization of the first two letters of a word and capitalization of the first word of the sentence can be automatically corrected from this page. If there are words you often misspell, enter the wrong and correct spellings in the **Replace** and **With** fields.

Spelling and Grammar Check
Word will automatically check for spelling and grammar errors as you type unless you turn this feature off. Spelling errors are noted in the document with a red underline. Grammar errors are indicated by a green underline. To disable this feature, select **Tools|Options** from the menu bar and click the **Spelling and Grammar tab** on the dialog box. Uncheck **"Check spelling as you type"** and **"Check grammar as you type"**, and click OK.

To use the spelling and grammar checker, follow these steps:

1. Select **Tools|Spelling and Grammar** from the menu bar.

2. The **Spelling and Grammar** dialog box will notify you of the first mistake in the document and misspelled words will be highlighted in red.



3. If the word is spelled correctly, click the **Ignore** button or click the **Ignore All** button if the word appears more than once in the document.

4. If the word is spelled incorrectly, choose one of the suggested spellings in the **Suggestions** box and click the **Change** button or **Change All** button to correct all occurrences of the word in the document. If the correct spelling is not suggested, enter the correct spelling in the **Not In Dictionary** box and click the **Change** button.

5. If the word is spelled correctly and will appear in many documents you type (such as your name), click the **Add** button to add the word to the dictionary so it will no longer appear as a misspelled word.

As long as the **Check Grammar** box is checked in the **Spelling and Grammar** dialog box, Word will check the grammar of the document in addition to the spelling. If you do not want the grammar checked, remove the checkmark from this box. Otherwise, follow these steps for correcting grammar:

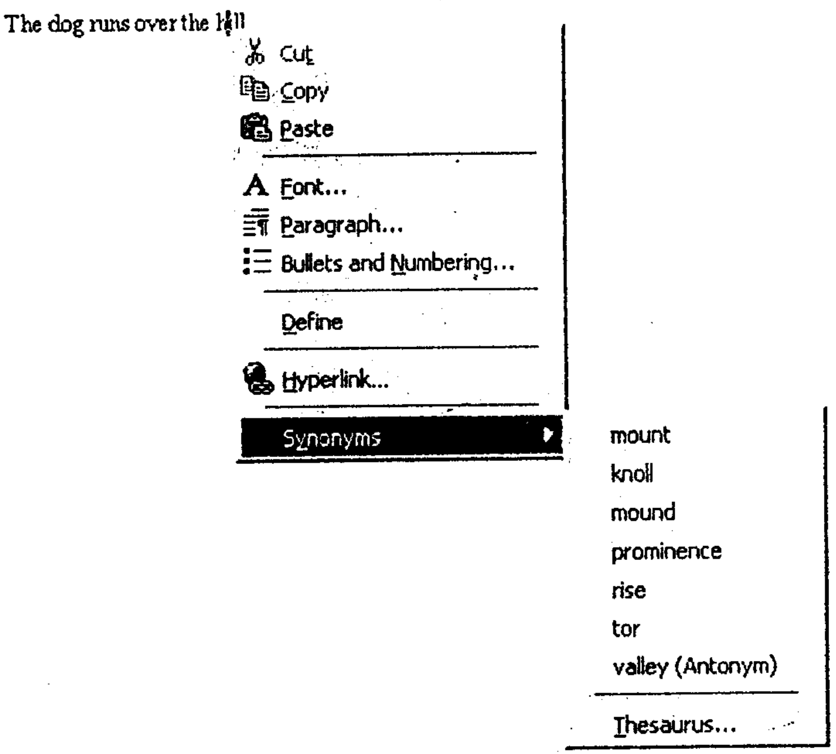
1. If Word finds a grammar mistake, it will be shown in the box as the spelling errors. The mistake is highlighted in green text.

Spelling and Grammar: English (U.S.)
Subject-Verb Agreement:
The dog run over the hill.
Ignore
Ignore Rule
Next Sentence
Suggestions:
dog runs
OR
dogs run
Change
Check grammar
Options...
Undo
Close

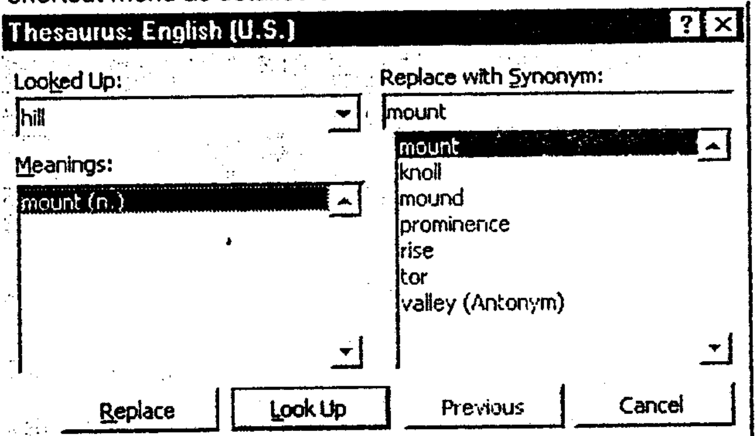
2. Several suggestions may be given in the **Suggestions** box. Select the correction that best applies and click **Change**.

3. If no correction is needed (Word is often wrong more than it is right), click the **Ignore** button.

Synonyms
Word 2000 has a new feature for finding synonyms. Simply right-click on the word and select **Synonyms** from the shortcut menu. From the list of suggested words, highlight the word you would like to use or click **Thesaurus...** for more options.



Thesaurus
To use the thesaurus, select **Tools|Language|Thesaurus** from the menu bar or select it from the **Synonyms** shortcut menu as detailed above.



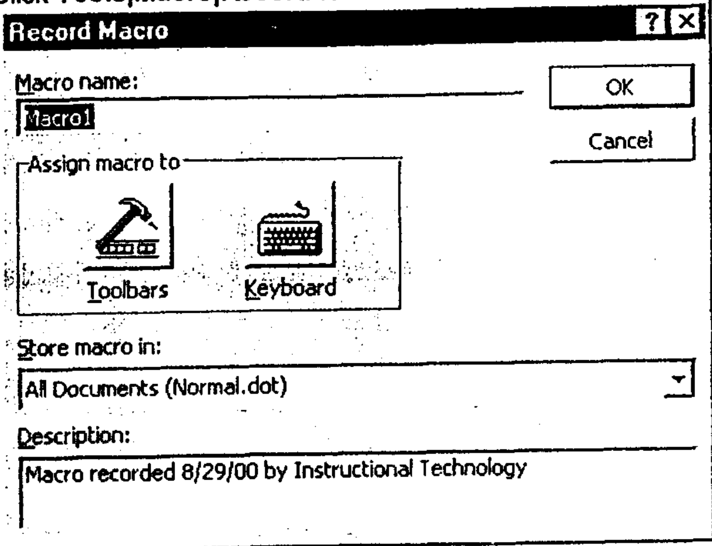
A list of meanings and synonyms are given on the windows. Double-click on the words in the **Meanings** box or click the **Look Up** button to view similar words. Double-click words in the **Replace with Synonym** box to view synonyms of those words. Highlight the word you would like to add and click the **Replace** button.

Macros

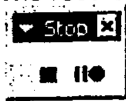
Macros are advanced features that can speed up editing or formatting you may perform often in a Word document. They record sequences of menu selections that you choose so that a series of actions can be completed in one step.

Recording A Macro
To record a macro, follow these steps:

1. Click **Tools|Macro|Record New Macro** on the menu bar.



2. Name the macro in the **Macro name** field. This name cannot contain spaces and or begin with a number.
3. From the **Store macro in** drop-down box, select the document you would like the macro to be associated with or choose "All Documents" be able to use the macro in any document.
4. Enter a description of the macro in the **Description** field. This is for your reference only so you remember what the macro does.
5. Click **OK** to begin recording.
6. Select options from the drop-down menus and Word will record the options you choose from the dialog boxes, such as changing the margins on the Page Setup window. Select only options that modify the document. Word will not record toggle actions such as **View|Toolbars** that have no effect on the document itself.
7. The recording toolbar will allow you to stop, pause, and resume recording.

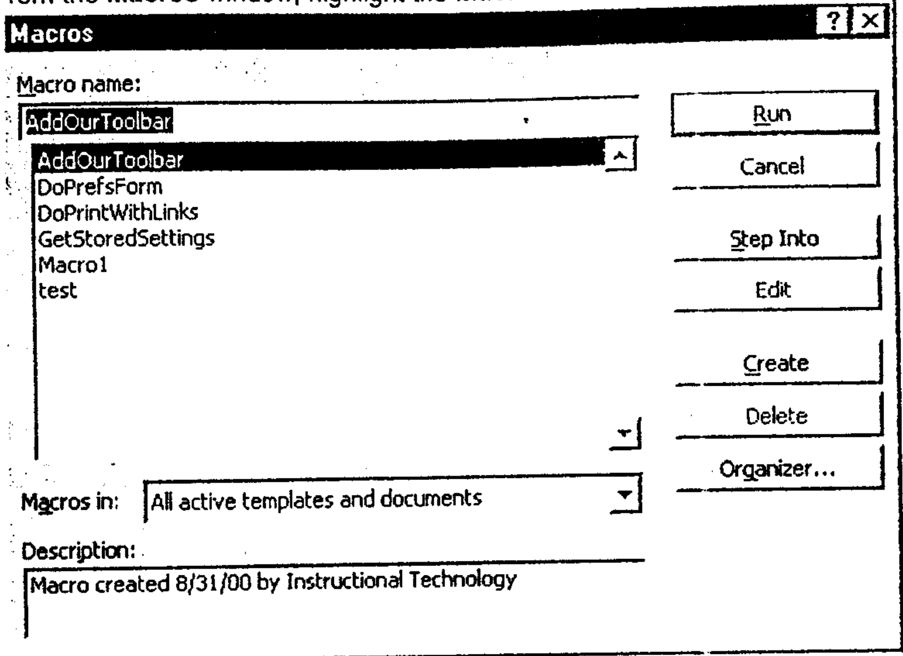


8. Click the **Stop** button the recording toolbar. The macro is now saved.

Running A Macro
To run an existing macro, follow these steps.

1. Select **Tools|Macro|Macros** from the menu bar.

2. From the **Macros** window, highlight the **Macro name** in the list and click **Run**.



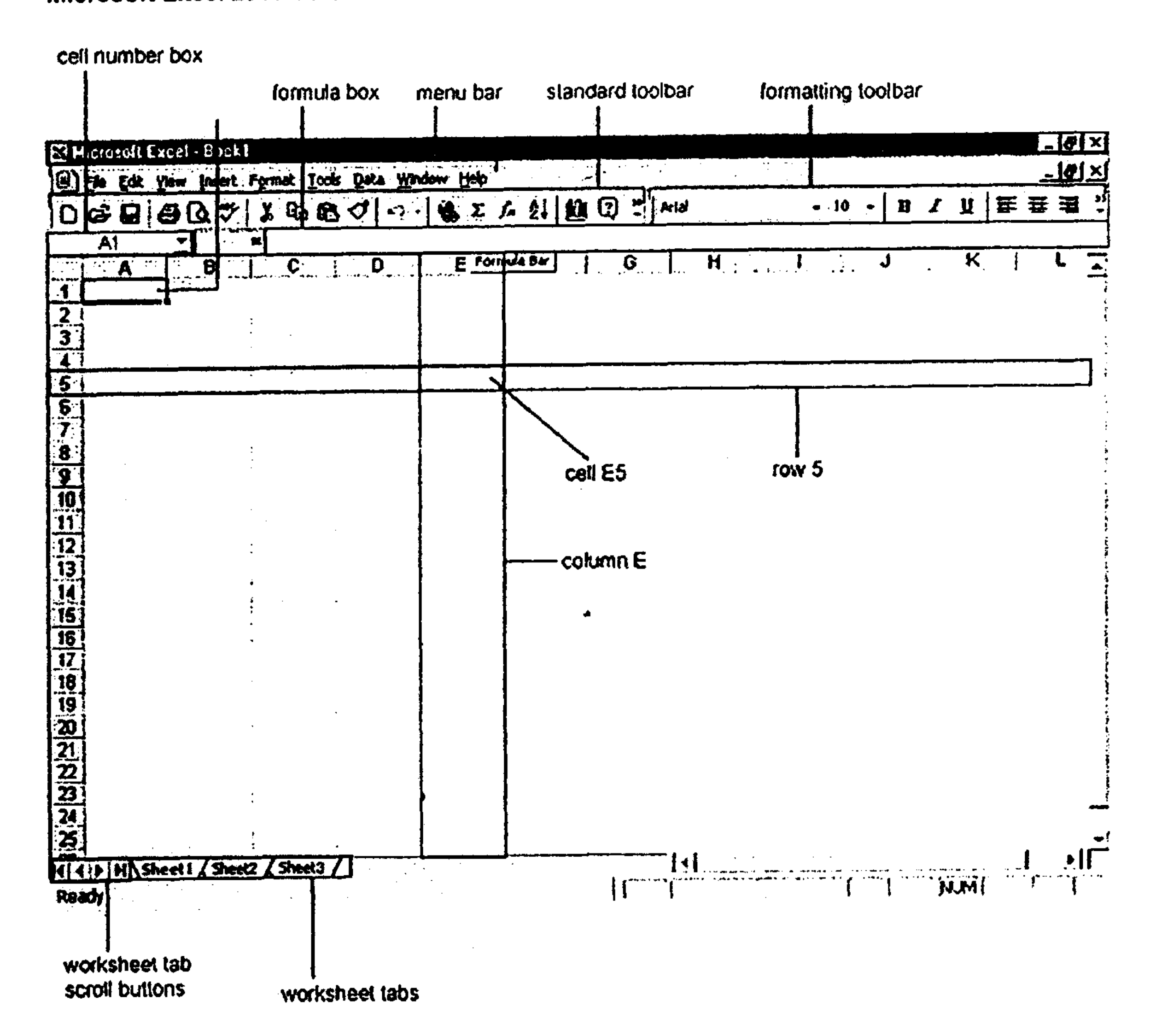
3. If the macro is long and you want to stop it while it is running, press **BREAK** (hold **CTRL** and press **PAUSE**).

Excel 2000

Spreadsheet Basics

Excel allows you to create spreadsheets much like paper ledgers that can perform automatic calculations. Each Excel file is a **workbook** that can hold many **worksheets**. The worksheet is a grid of **columns** (designated by letters) and **rows** (designated by numbers). The letters and numbers of the columns and rows (called **labels**) are displayed in gray buttons across the top and left side of the worksheet. The intersection of a column and a row is called a **cell**. Each cell on the spreadsheet has a **cell address** that is the column letter and the row number. Cells can contain either text, numbers, or mathematical formulas.

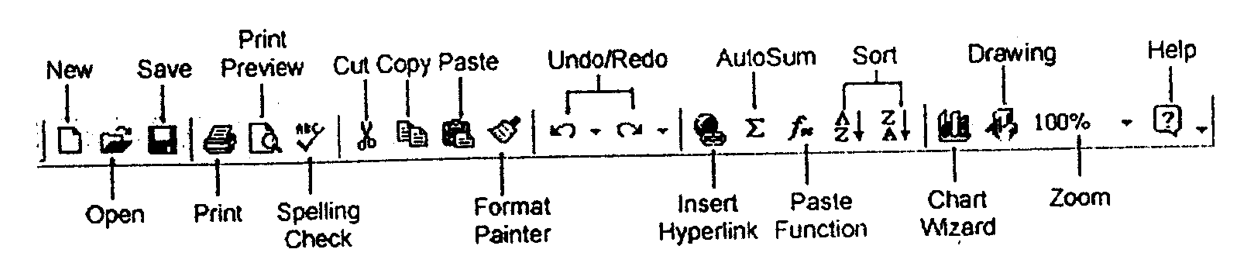
Microsoft Excel 2000 Screen Elements



Adding and Renaming Worksheets

The worksheets in a workbook are accessible by clicking the worksheet tabs just above the status bar. By default, three worksheets are included in each workbook. To add a sheet, select **Insert|Worksheet** from the menu bar. To rename the worksheet tab, right-click on the tab with the mouse and select **Rename** from the shortcut menu. Type the new name and press the **ENTER** key.

The Standard Toolbar
This toolbar is located just below the menu bar at the top of the screen and allows you to quickly access basic Excel commands.



New - Select **File|New** from the menu bar, press **CTRL+N**, or click the **New** button to create a new workbook.

Open - Click **File|Open** from the menu bar, press **CTRL+O**, or click the **Open** folder button to open an existing workbook.

Save - The first time you save a workbook, select **File|Save As** and name the file. After the file is named click **File|Save, CTRL+S**, or the Save button on the standard toolbar.

Print - Click the Print button to print the worksheet.

Print Preview - This feature will allow you to preview the worksheet before it prints.

Spell Check - Use the spell checker to correct spelling errors on the worksheet.

Cut, Copy, Paste, and Format Painter - These actions are explained in the Modifying A Worksheet section.

Undo and Redo - Click the backward **Undo** arrow to cancel the last action you performed, whether it be entering data into a cell, formatting a cell, entering a function, etc. Click the forward **Redo** arrow to cancel the undo action.

Insert Hyperlink - To insert a hyperlink to a web site on the Internet, type the text into a cell you want to be the link that can be clicked with the mouse. Then, click the Insert Hyperlink button and enter the web address you want the text to link to and click **OK**.

Autosum, Function Wizard, and Sorting - These features are discussed in detail in the Functions tutorial.

Zoom - To change the size that the worksheet appears on the screen, choose a different percentage from the Zoom menu.

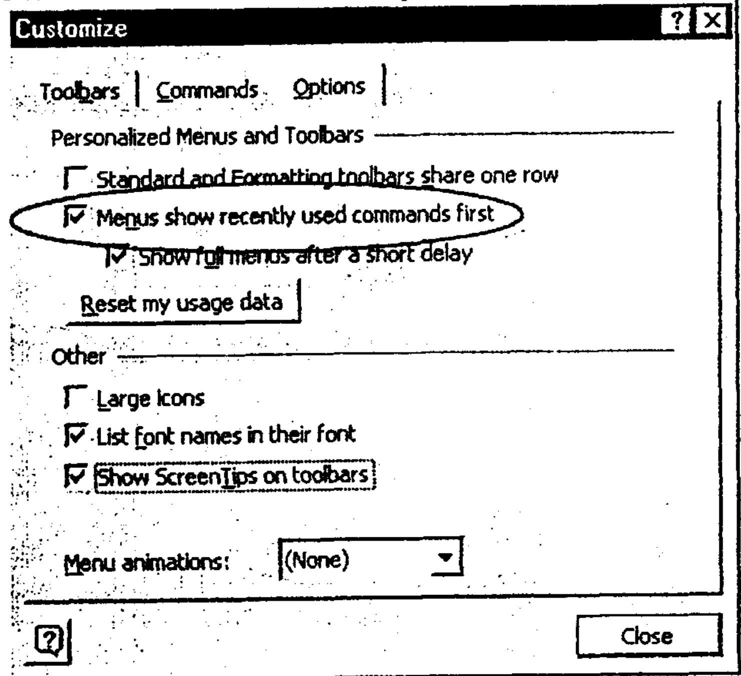
Customizing Excel

Menus
Unlike previous versions of Excel, the menus in Excel 2000 initially list only the commands you have recently used. To view all options in each menu, click the double arrows at the bottom of the menu. If you would like to revert to the way older versions of Excel displayed menu options, follow these steps:

1. Select **View|Toolbars|Customize** from the menu bar.

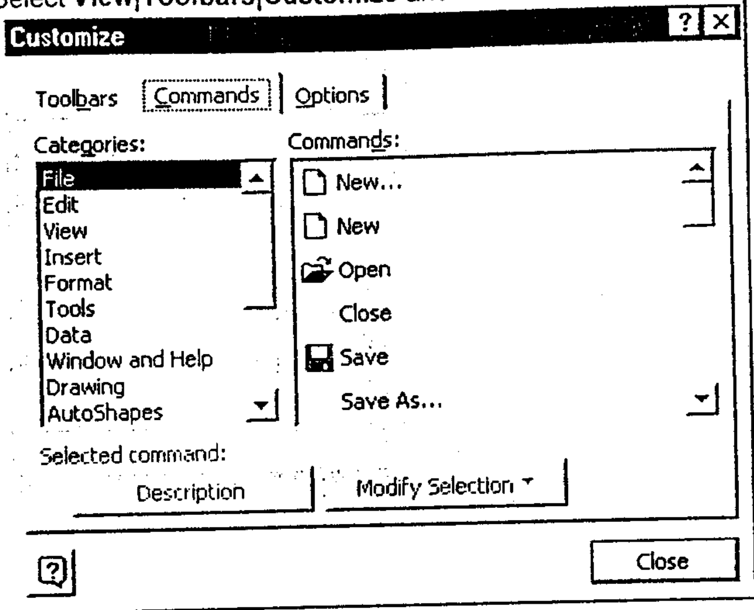
2. Click on the **Options** tab.

3. Uncheck the **Menus show recently used commands first** check box.



Toolbars
Many toolbars displaying shortcut buttons are available. Select **View|Toolbars** from the menu bar to select more toolbars.
Customize Toolbars
Customizing toolbars allows you to delete certain shortcut buttons from a toolbar if you do not use them and add the shortcut buttons for commands you use often.

1. Select **View|Toolbars|Customize** and select the **Commands** tab.



2. By clicking on the command categories in the **Categories** box, the commands will change in the **Commands** box to the right.

3. Select the command you would like to add to the toolbar by selecting it from the **Commands** box.

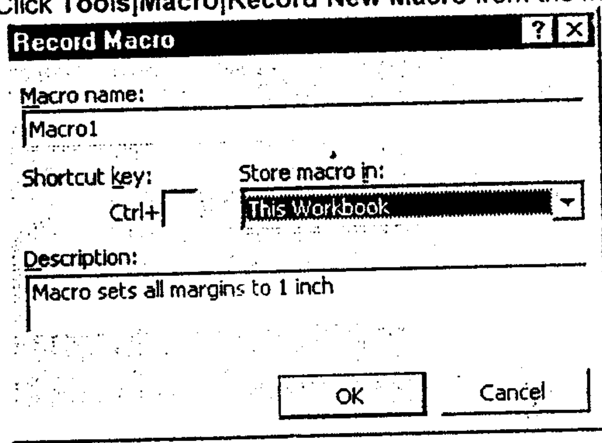
4. Drag the command with the mouse to the desired location on the toolbar and release the mouse button. The shortcut button should now appear on the toolbar.

5. Remove buttons from the toolbars by reversing these steps. Highlight the button on the toolbar, drag it off the toolbar with the mouse, and release the mouse button.

Recording A Macro

Macros can speed up any common editing sequence you may execute in an Excel spreadsheet. In this example we will make a simple macro that will set all the margins on the page to one inch.

1. Click **Tools|Macro|Record New Macro** from the menu bar.



2. Name the macro in the **Macro name** field. The name cannot contain spaces and must not begin with a number.

3. If you would like to assign a shortcut key to the macro for easy use, enter the letter under **Shortcut key**. Enter a lower case letter to make a CTRL+number shortcut and enter an upper case letter to assign a CTRL+SHIFT+number shortcut key. If you select a shortcut key that Excel already uses, your macro will overwrite that function.

4. Select an option from the **Store macro in** drop-down menu.

5. Enter a description of the macro in the **Description** field. This is for your reference only so you remember what the macro does.

6. Click **OK** when you are ready to start recording.

7. Select options from the drop down menus and Excel will record the options you choose from the dialog boxes, such as changing the margins on the Page Setup window. Select **File|Page Setup** and change all the margins to 1". Press **OK**. Replace this step with whatever commands you want your macro to execute. Select only options that modify the worksheet. Toggle actions such as **View|Toolbars** that have no effect on the worksheet will not be recorded.

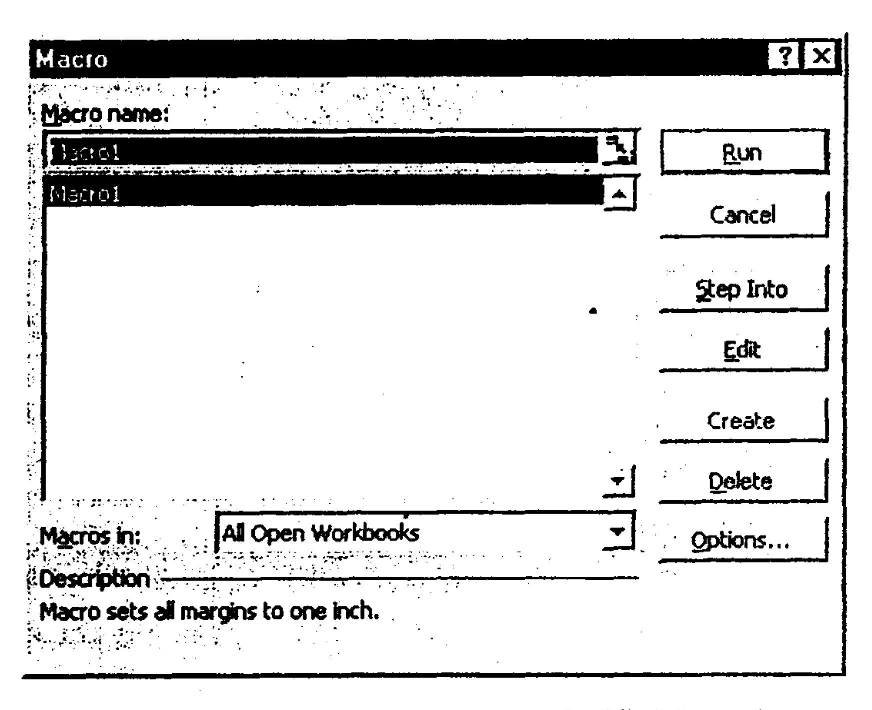


8. Click the **Stop** button the recording toolbar. The macro is now saved.

Running A Macro

1. To run a macro you have created, select **Tools|Macro|Macros** from the menu bar.

2. From the **Macros** window, highlight the **Macro name** in the list and click **Run**.



3. If the macro is long and you want to stop it while it is running, press **BREAK** (hold **CTRL** and press **PAUSE**).

Modifying a Worksheet

Moving Through Cells
Use the mouse to select a cell you want to begin adding data to and use the keyboard strokes listed in the table below to move through the cells of a worksheet.

Movement	Key stroke
One cell up	up arrow key
One cell down	down arrow key or **ENTER**
One cell left	left arrow key
One cell right	right arrow key or **TAB**
Top of the worksheet (cell A1)	**CTRL+HOME**
End of the worksheet (last cell containing data)	**CTRL+END**
End of the row	**CTRL+**right arrow key
End of the column	**CTRL+**down arrow key
Any cell	**File|Go To** menu bar command

Adding Worksheets, Rows, and Columns

- **Worksheets** - Add a worksheet to a workbook by selecting **Insert|Worksheet** from the menu bar.
- **Row** - To add a row to a worksheet, select **Insert|Rows** from the menu bar, or highlight the row by clicking on the row label, right-click with the mouse, and choose **Insert**.
- **Column** - Add a column by selecting **Insert|Columns** from the menu bar, or highlight the column by click on the column label, right-click with the mouse, and choose **Insert**.

Resizing Rows and Columns
There are two ways to resize rows and columns.

1. **Resize a row** by dragging the line below the label of the row you would like to resize. **Resize a column** in a similar manner by dragging the line to the right of the label corresponding to the column you want to resize.
   - OR -

2. Click the row or column label and select **Format|Row|Height** or **Format|Column|Width** from the menu bar to enter a numerical value for the height of the row or width of the column.

Selecting Cells
Before a cell can be modified or formatted, it must first be selected (highlighted). Refer to the table below for selecting groups of cells.

Cells to select	Mouse action
One cell	click once in the cell
Entire row	click the row label
Entire column	click the column label
Entire worksheet	click the whole sheet button
Cluster of cells	drag mouse over the cells or hold down the **SHIFT** key while using the arrow keys

To activate the contents of a cell, double-click on the cell or click once and press F2.

Moving and Copying Cells

Moving Cells
To cut cell contents that will be moved to another cell select **Edit|Cut** from the menu bar or click the **Cut** button on the standard toolbar.

Copying Cells
To copy the cell contents, select **Edit|Copy** from the menu bar or click the **Copy** button on the standard toolbar.

Pasting Cut and Copied Cells
Highlight the cell you want to paste the cut or copied content into and select **Edit|Paste** from the menu bar or click the **Paste** button on the standard toolbar.

Drag and Drop
If you are moving the cell contents only a short distance, the drag-and-drop method may be easier. Simply drag the highlighted border of the selected cell to the destination cell with the mouse.

Freeze Panes
If you have a large worksheet with column and row headings, those headings will disappear as the worksheet is scrolled. By using the Freeze Panes feature, the headings can be visible at all times.

1. Click the label of the row below the row that should remain frozen at the top of the worksheet.

2. Select **Window|Freeze Panes** from the menu bar.

3. To remove the frozen panes, select **Window|Unfreeze Panes.**

Book1.xls

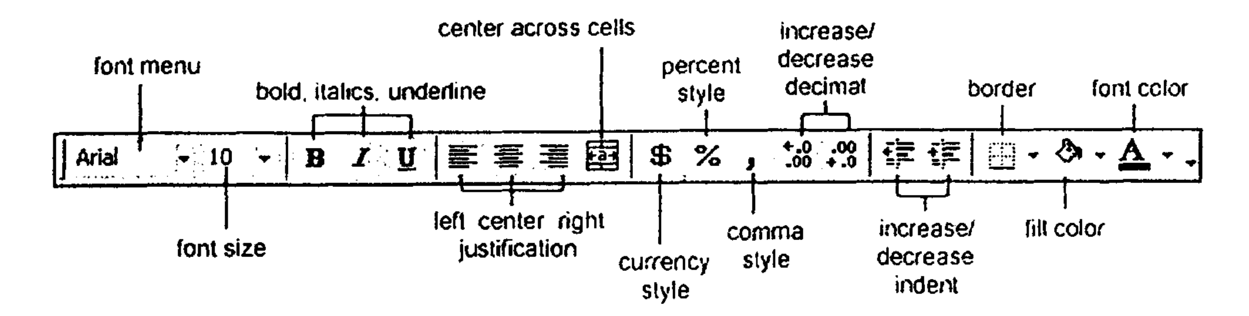
	A	B	C	D	E
1		January	February	March	April
6	Class 5	34	23	48	29
7	Class 6	54	71	24	48
8	Class 7	34	23	34	24
9	Class 8	45	34	34	34
10	Class 9	43	54	54	23
11	Class 10	23	34	34	71
12	Class 11	42	45	33	23
13	Class 12	28	34	34	34
14	Class 13	29	23	23	54
15	Class 14	48	71	71	34
16	Class 15	24	23	23	45
17	Class 16	22	34	34	28

Sheet2 Sheet3 Sheet4

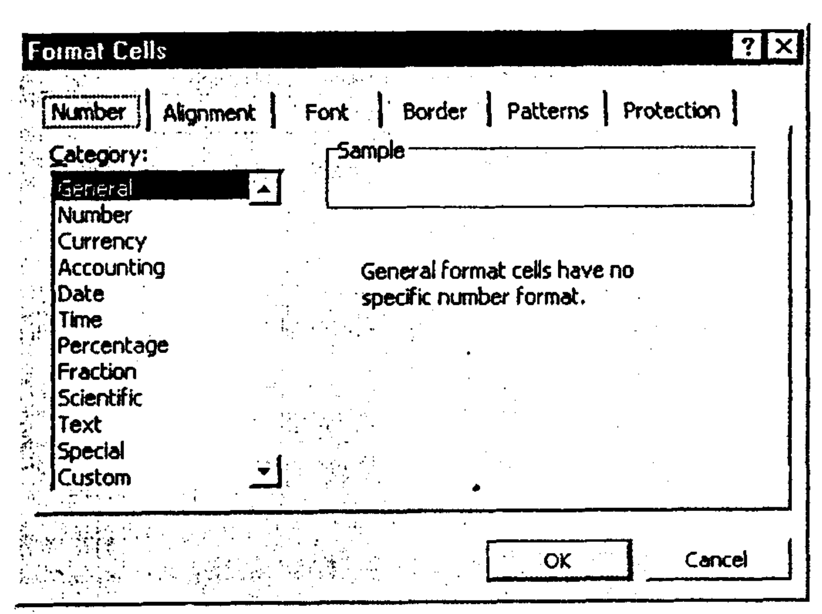
Freeze panes has been added to row 1 in the image above. Notice that the row numbers skip from 1 to 6. As the worksheet is scrolled, row 1 will remain stationary while the remaining rows will move.

Formatting Cells

Formatting Toolbar
The contents of a highlighted cell can be formatted in many ways. Font and cell attributes can be added from shortcut buttons on the formatting bar. If this toolbar is not already visible on the screen, select **View|Toolbars|Formatting** from the menu bar.



Format Cells Dialog Box
For a complete list of formatting options, right-click on the highlighted cells and choose **Format Cells** from the shortcut menu or select **Format|Cells** from the menu bar.



- **Number tab** - The data type can be selected from the options on this tab. Select **General** if the cell contains text and number, or another numerical category if the cell is a number that will be included in functions or formulas.

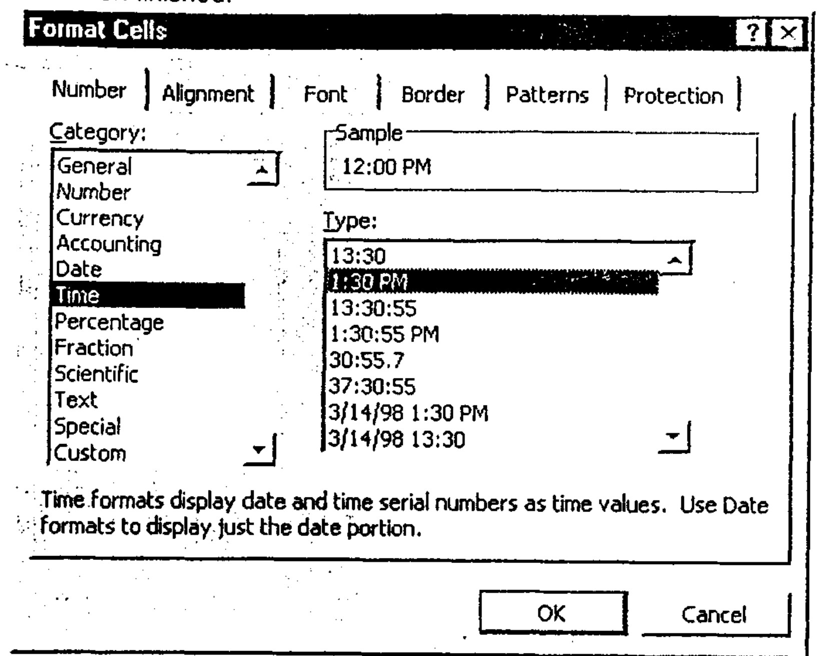
- **Alignment tab** - These options allow you to change the position and alignment of the data with the cell.

- **Font tab** - All of the font attributes are displayed in this tab including font face, size, style, and effects.

- **Border and Pattern tabs** - These tabs allow you to add borders, shading, and background colors to a cell.

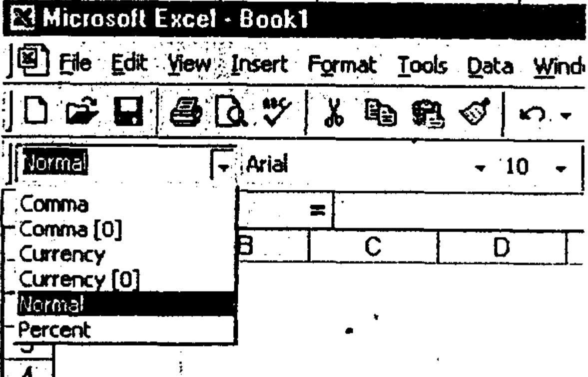
Dates and Times
If you enter the date "January 1, 2001" into a cell on the worksheet, Excel will automatically recognize the text as a date and change the format to "1-Jan-01". To change the date format, select the **Number** tab from the **Format Cells** window. Select "Date" from the **Category** box and choose the format for the date from the **Type** box. If the field is a time, select "Time" from

the **Category** box and select the type in the right box Date and time combinations are also listed. Press **OK** when finished.



Styles

The use of styles in Excel allow you to quickly format your worksheet, provide consistency, and create a professional look. Select the Styles drop-down box from the formatting toolbar (it can be added by customizing the toolbar). Excel provides several preset styles:



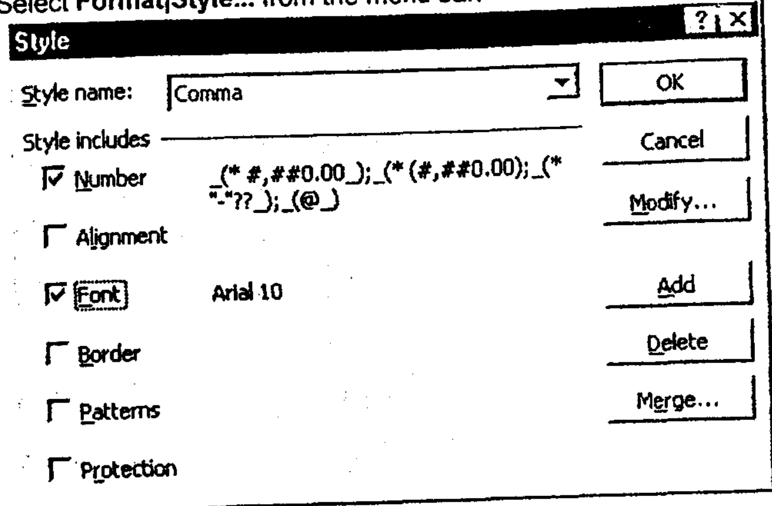
- **Comma** - Adds commas to the number and two digits beyond a decimal point.
- **Comma [0]** - Comma style that rounds to a whole number.
- **Currency** - Formats the number as currency with a dollar sign, commas, and two digits beyond the decimal point.
- **Currency [0]** - Currency style that rounds to a whole number.
- **Normal** - Reverts any changes to general number format.
- **Percent** - Changes the number to a percent and adds a percent sign.

Style Dialog Box

Create your own styles from the Style Dialog Box.

1. Highlight the cell(s) you want to add a style to.

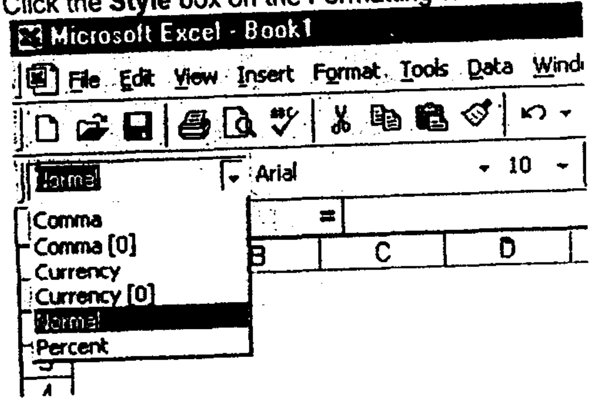
2. Select **Format|Style...** from the menu bar.



3. Modify the attributes by clicking the **Modify** button.
4. Check all the items under **Style includes** that the style should format.
5. Click **Add** to preview the formatting changes on the worksheet.
6. Highlight the style you want to apply to the paragraph and click **Apply**.

Create a New Style

1. Select the cell on the worksheet containing the formatting you would like to set as a new style.
2. Click the **Style** box on the Formatting toolbar so the style name is highlighted.



3. Delete the text in the Style box and type the name of the new style.
4. Press **ENTER** when finished.

Format Painter

A handy feature on the standard toolbar for formatting text is the Format Painter. If you have formatted a cell with a certain font style, date format, border, and other formatting options, and you want to format another cell or group of cells the same way, place the cursor within the cell containing the formatting you want to copy. Click the **Format Painter** button in the standard toolbar (notice that your pointer now has a paintbrush beside it). Highlight the cells you want to add the same formatting to.

To copy the formatting to many groups of cells, double-click the **Format Painter** button. The format painter remains active until you press the **ESC** key to turn it off.

AutoFormat

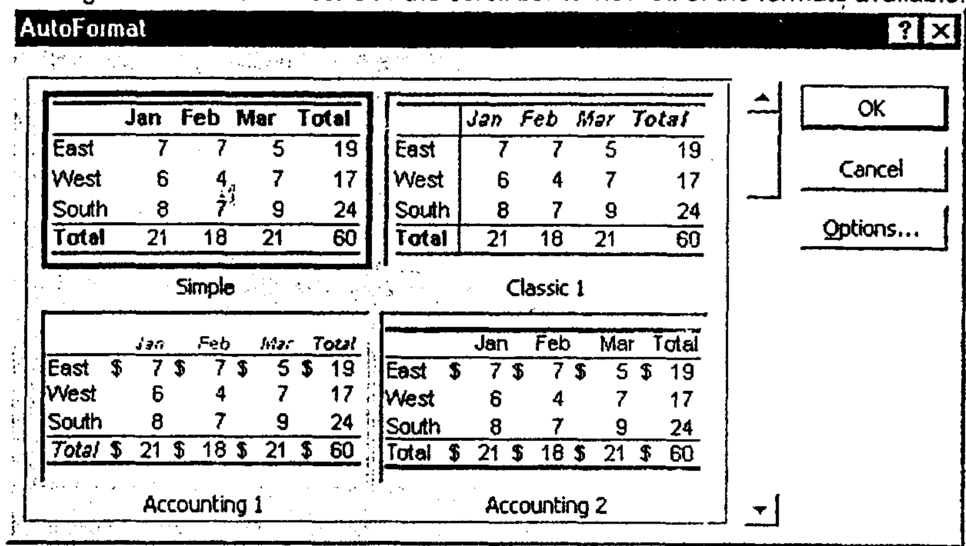
Excel has many preset table formatting options. Add these styles by following these steps:

1. Highlight the cells that will be formatted.

	A	B	C	D
1	Textbook	Quantity	Price	
2	Biology	4	$99.99	
3	Chemistry	2	$79.95	
4	Calculus	7	$65.99	
5	English	12	$49.99	

2. Select **Format|AutoFormat** from the menu bar.

3. On the AutoFormat dialog box, select the format you want to apply to the table by clicking on it with the mouse. Use the scroll bar to view all of the formats available.



4. Click the **Options...** button to select the elements that the formatting will apply to.

5. Click **OK** when finished.

	A	B	C	D
1	*Textbook*	*Quantity*	*Price*	
2	Biology	4	$99.99	
3	Chemistry	2	$79.95	
4	Calculus	7	$65.99	
5	English	12	$49.99	

Formulas and Functions

The distinguishing feature of a spreadsheet program such as Excel is that it allows you to create mathematical formulas and execute functions. Otherwise, it is not much more than a large table for displaying text. This page will show you how to create these calculations.

Formulas
Formulas are entered in the worksheet cell and must begin with an equal sign "=". The formula then includes the addresses of the cells whose values will be manipulated with appropriate operands placed in between. After the formula is typed into the cell, the calculation executes immediately and the formula itself is visible in the formula bar. See the example below to view the formula for calculating the sub total for a number of textbooks. The formula multiplies the quantity and price of each textbook and adds the subtotal for each book.

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U $ %

C7 =((B2*C2)+(B3*C3)+(B4*C4)+(B5*C5))

formula bar

	A	B	C	D	E	F
1	**Textbook**	**Quantity**	**Price**			
2	Biology	4	$99.99			
3	Chemistry	2	$79.95			
4	Calculus	7	$65.99			
5	English	12	$49.99			
6						
7		**Sub Total**	$1,621.67			
8		**Sales Tax**	6%			
9		**Total**	$1,718.97			
10						
11						
12						

Linking Worksheets

You may want to use the value from a cell in another worksheet within the same workbook in a formula. For example: the value of cell A1 in the current worksheet and cell A2 in the second worksheet can be added using the format "sheetname!celladdress". The formula for this example would be "=A1+Sheet2!A2" where the value of cell A1 in the current worksheet is added to the value of cell A2 in the worksheet named "Sheet2".

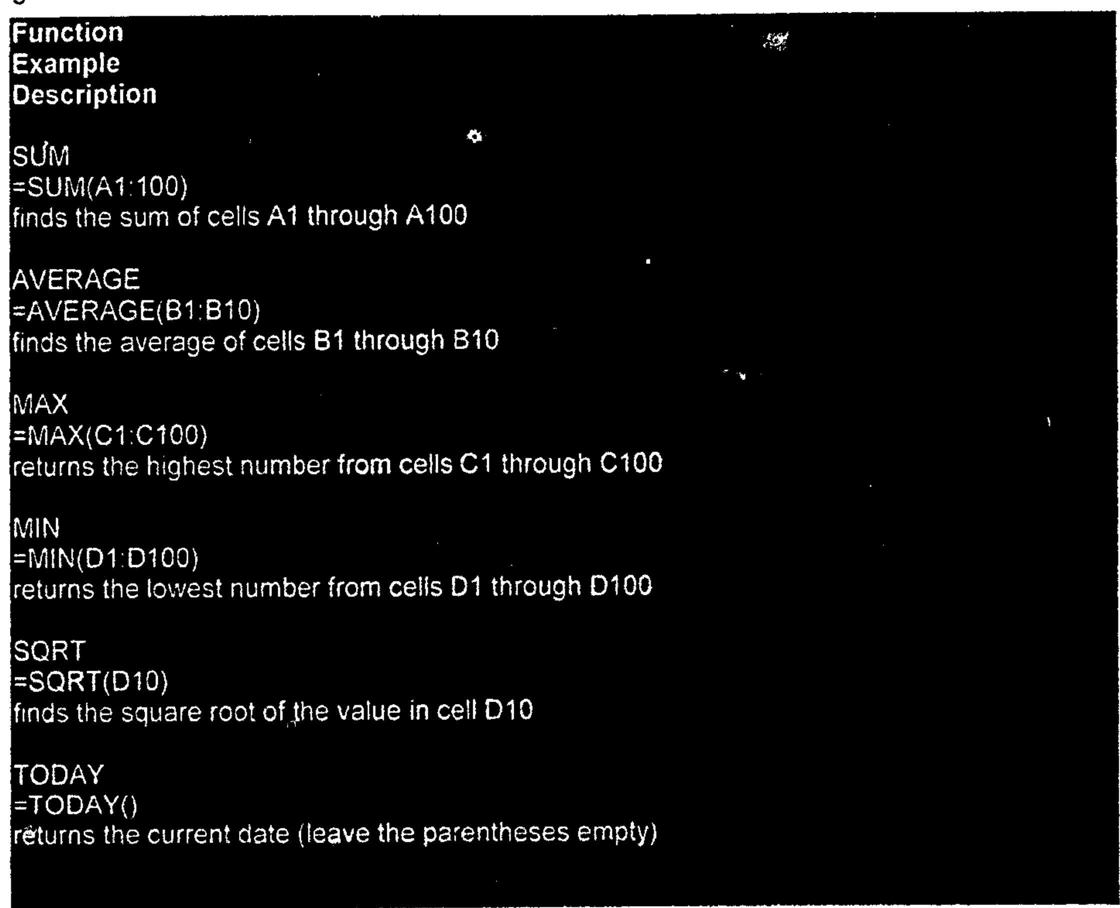
Relative, Absolute, and Mixed Referencing

Calling cells by just their column and row labels (such as "A1") is called **relative referencing**. When a formula contains relative referencing and it is copied from one cell to another, Excel does not create an exact copy of the formula. It will change cell addresses relative to the row and column they are moved to. For example, if a simple addition formula in cell C1 "=(A1+B1)" is copied to cell C2, the formula would change to "=(A2+B2)" to reflect the new row. To prevent this change, cells must be called by **absolute referencing** and this is accomplished by placing dollar signs "$" within the cell addresses in the formula. Continuing the previous example, the formula in cell C1 would read "=(A1+B1)" if the value of cell C2 should be the sum of cells A1 and B1. Both the column and row of both cells are absolute and will not change when copied. **Mixed referencing** can also be used where only the row

OR column fixed. For example, in the formula "=(A$1+$B2)", the row of cell A1 is fixed and the column of cell B2 is fixed.

Basic Functions

Functions can be a more efficient way of performing mathematical operations than formulas. For example, if you wanted to add the values of cells D1 through D10, you would type the formula "=D1+D2+D3+D4+D5+D6+D7+D8+D9+D10". A shorter way would be to use the SUM function and simply type "=SUM(D1:D10)". Several other functions and examples are given in the table below:



Function	Example	Description
SUM	=SUM(A1:100)	finds the sum of cells A1 through A100
AVERAGE	=AVERAGE(B1:B10)	finds the average of cells B1 through B10
MAX	=MAX(C1:C100)	returns the highest number from cells C1 through C100
MIN	=MIN(D1:D100)	returns the lowest number from cells D1 through D100
SQRT	=SQRT(D10)	finds the square root of the value in cell D10
TODAY	=TODAY()	returns the current date (leave the parentheses empty)

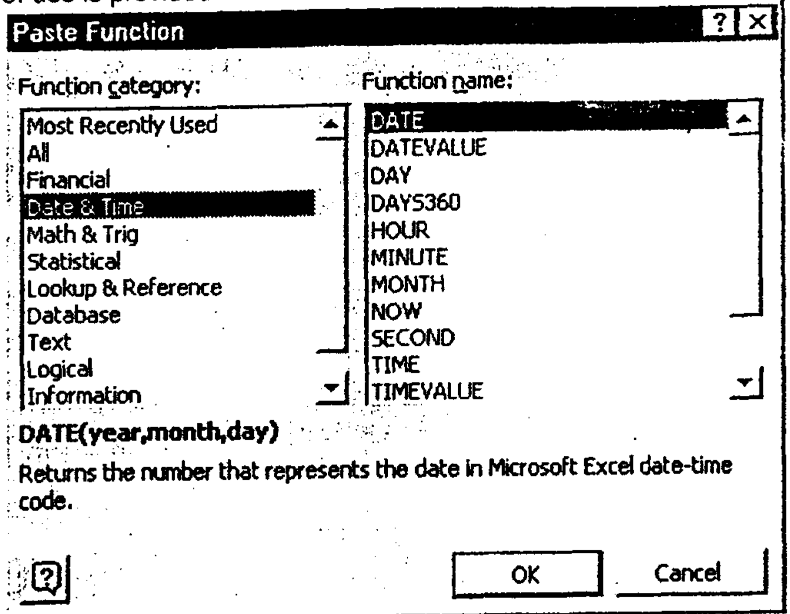
Function Wizard

View all functions available in Excel by using the Function Wizard.

1. Activate the cell where the function will be placed and click the **Function Wizard** button on the standard toolbar.

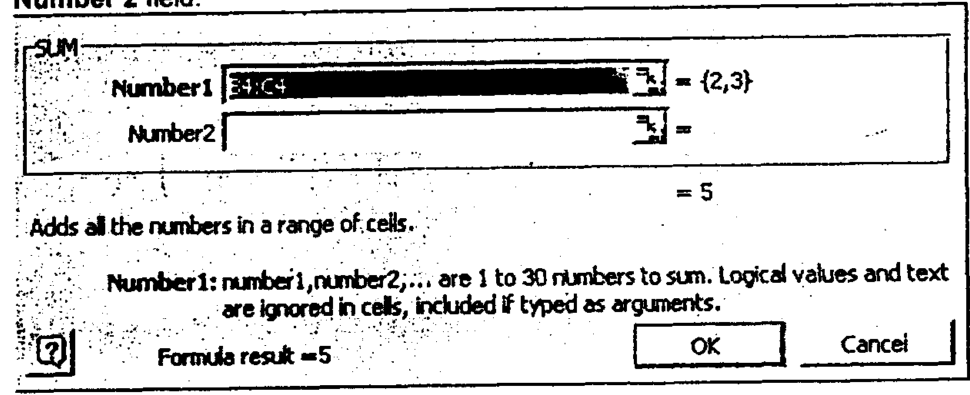
2. From the **Paste Function** dialog box, browse through the functions by clicking in the **Function category** menu on the left and select the function from the **Function name** choices on the right. As each function name is highlighted a description and example

of use is provided below the two boxes.



3. Click **OK** to select a function.

4. The next window allows you to choose the cells that will be included in the function. In the example below, cells B4 and C4 were automatically selected for the sum function by Excel. The cell values {2, 3} are located to the right of the **Number 1** field where the cell addresses are listed. If another set of cells, such as B5 and C5, needed to be added to the function, those cells would be added in the format "B5:C5" to the **Number 2** field.



5. Click **OK** when all the cells for the function have been selected.

Autosum 'Σ'

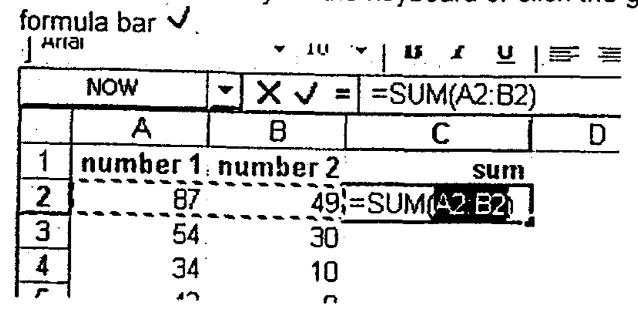
Use the Autosum function to add the contents of a cluster of adjacent cells.

1. Select the cell that the sum will appear in that is outside the cluster of cells whose values will be added. Cell C2 was used in this example.

2. Click the **Autosum** button (Greek letter sigma) on the standard toolbar.

3. Highlight the group of cells that will be summed (cells A2 through B2 in this example).

4. Press the **ENTER** key on the keyboard or click the green check mark button on the formula bar ✓.



Sorting and Filling

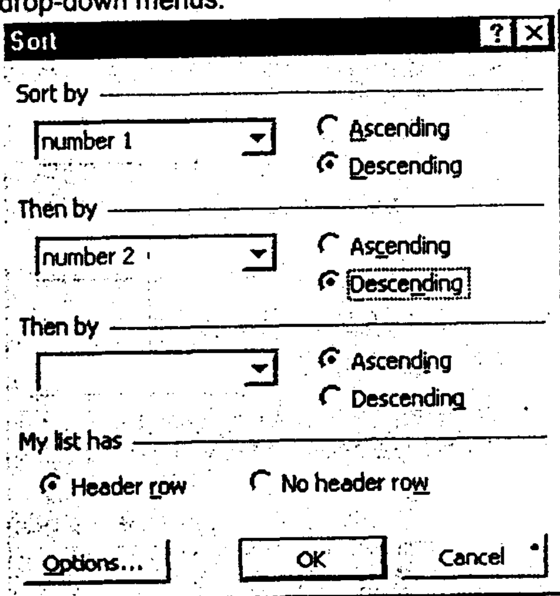
Basic Sorts A↓Z Z↓A

To execute a basic descending or ascending sort based on one column, highlight the cells that will be sorted and click the **Sort Ascending** (A-Z) button or **Sort Descending** (Z-A) button on the standard toolbar.

Complex Sorts

To sort by multiple columns, follow these steps:

1. Highlight the cells, rows, or columns that will be sorted.
2. Select **Data|Sort** from the menu bar.
3. From the **Sort** dialog box, select the first column for sorting from the **Sort By** drop-down menu and choose either ascending or descending.
4. Select the second column and, if necessary, the third sort column from the **Then By** drop-down menus.



5. If the cells you highlighted included the text headings in the first row, mark **My list has...Header row** and the first row will remain at the top of the worksheet.
6. Click the **Options** button for special non-alphabetic or numeric sorts such as months of the year and days of the week.

Sort Options
First key sort order
Sunday, Monday, Tuesday, Wedr
OK
Cancel
Case sensitive
Orientation
Sort top to bottom
Sort left to right

7. Click **OK** to execute the sort.

Autofill

The Autofill feature allows you to quickly fill cells with repetitive or sequential data such as chronological dates or numbers, and repeated text.

1. Type the beginning number or date of an incrementing series or the text that will be repeated into a cell.

2. Select the handle at the bottom, right corner of the cell with the left mouse button and drag it down as many cells as you want to fill.

3. Release the mouse button.

If you want to autofill a column with cells displaying the same number or date you must enter identical data to two adjacent cells in a column. Highlight the *two* cells and drag the handle of the selection with the mouse.

Alternating Text and Numbers with Autofill

The Autofill feature can also be used for alternating text or numbers. For example, to make a repeating list of the days of the week, type the seven days into seven adjacent cells in a column. Highlight the seven cells and drag down with the mouse.

Autofilling Functions

Autofill can also be used to copy functions. In the example below, column A and column B each contain lists of numbers and column C contains the sums of columns A and B for each row. The function in cell C2 would be "=SUM(A2:B2)". This function can then be copied to the remaining cells of column C by activating cell C2 and dragging the handle down to fill in the remaining cells. The autofill feature will automatically update the row numbers as shown below if the cells are reference relatively.

C2 = =SUM(A2:B2)

	A	B	C	D
1	number 1	number 2	sum	
2	87	49	136	
3	54	30		
4	34	10		
5	43	8		
6	24	23		
7	93	97		
8	40	32		
9	59	30		
10	82	87		
11	39	57		
12				

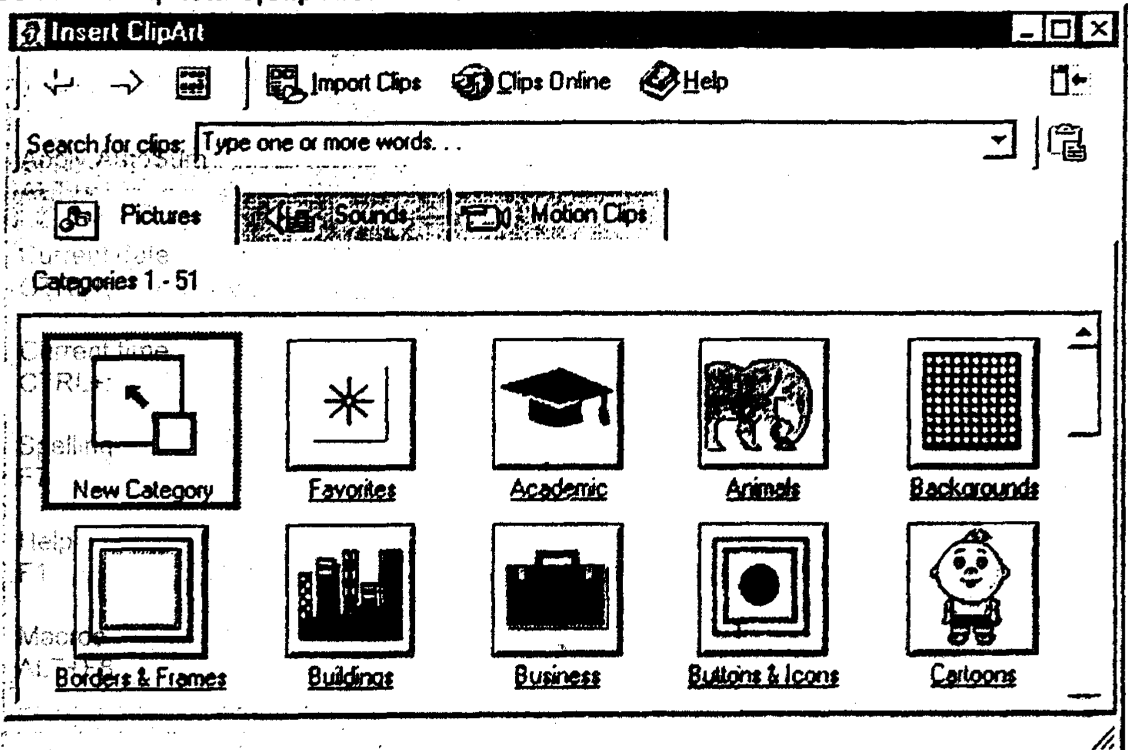
C11 = =SUM(A11:B11)

	A	B	C	D
1	number 1	number 2	sum	
2	87	49	136	
3	54	30	84	
4	34	10	44	
5	43	8	51	
6	24	23	47	
7	93	97	190	
8	40	32	72	
9	59	30	89	
10	82	87	169	
11	39	57	96	
12				

Graphics

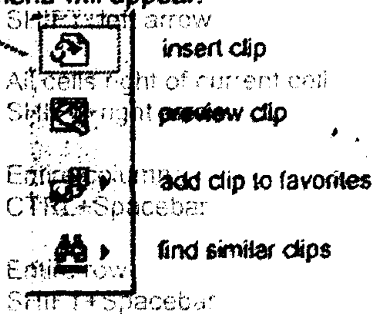
Adding Clip Art
To add a clip art image to the worksheet, follow these steps:

1. Select **Insert|Picture|Clip Art** from the menu bar.



2. To find an image, click in the white box following **Search for clips**. Delete the words "Type one or more words. . ." and enter keywords describing the image you want to use.
   - OR -
   Click one of the category icons.

3. Click once on the image you want to add to the worksheet and the following popup menu will appear:



   - **Insert Clip** to add the image to the worksheet.
   - **Preview Clip** to view the image full-size before adding it to the worksheet. Drag the bottom, right corner of the preview window to resize the image and

click the "x" close button to end the preview.



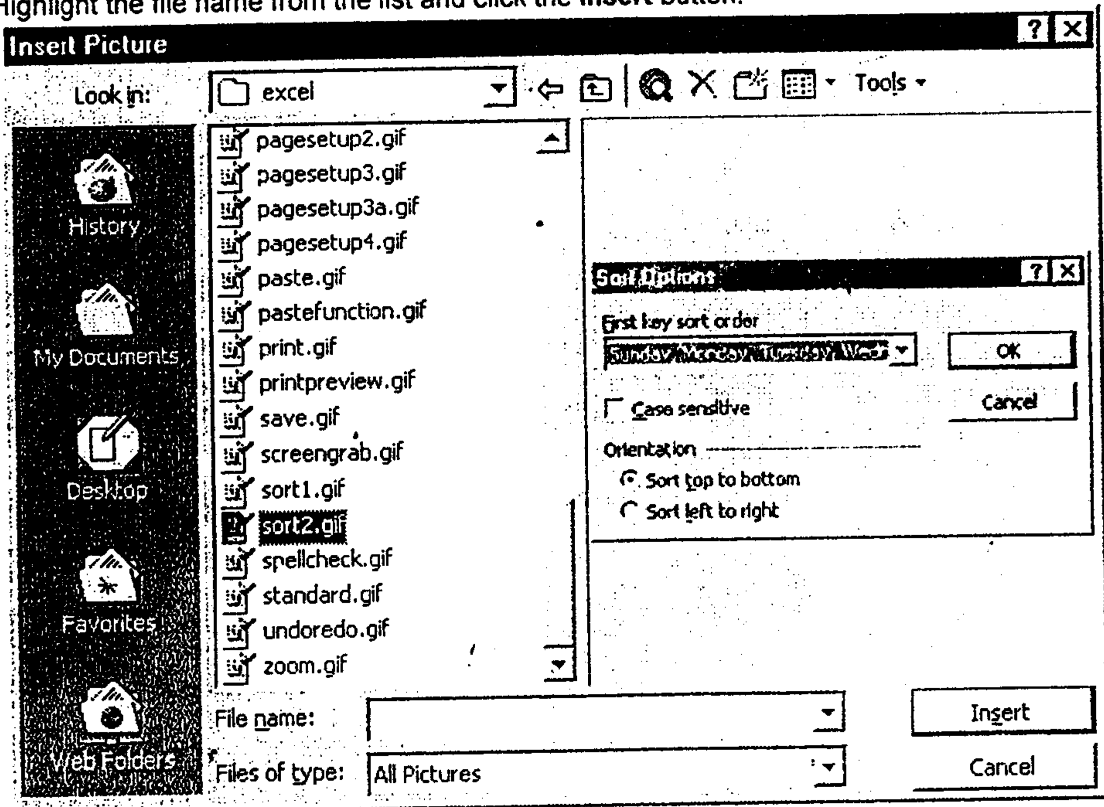
- **Add Clip to Favorites** will add the selected image to your favorites directory that can be chosen from the **Insert ClipArt** dialog box.
- **Find Similar Clips** will retrieve images similar to the one you have chosen.

4. Continue selecting images to add to the worksheet and click the **Close** button in the top, right corner of the **Insert ClipArt** window to stop adding clip art to the worksheet.

Add An Image from a File

Follow these steps to add a photo or graphic from an existing file:

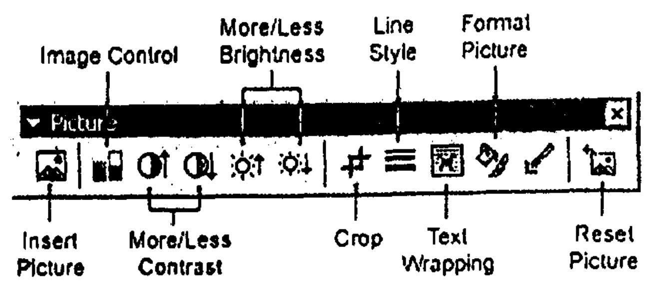
1. Select **Insert|Picture|From File** on the menu bar.
2. Click the down arrow button on the right of the **Look in:** window to find the image on your computer.
3. Highlight the file name from the list and click the **Insert** button.



Editing A Graphic

Activate the image you wish to edit by clicking on it once with the mouse. Nine handles will appear around the graphic. Click and drag these handles to resize the image. The handles on

the corners will resize proportionally while the handles on the straight lines will stretch the image. More picture effects can be changed using the Picture toolbar. The **Picture toolbar** should appear when you click on the image. Otherwise, select **View|Toolbars|Picture** from the menu bar to activate it.



- **Insert Picture** will display the image selection window and allows you to change the image.

- **Image Control** allows to to make the image gray scale, black and white, or a watermark.

- **More/Less Contrast** modifies the contrast between the colors of the image.

- **More/Less Brightness** will darken or brighten the image.

- Click **Crop** and drag the handles on the activated image to delete outer portions of the image.

- **Line Style** will add a variety of borders to the graphic.

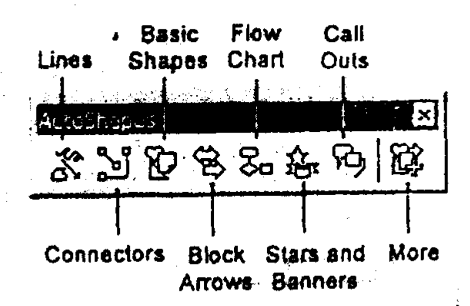
- **Text Wrapping** will modify the way the worksheet text wraps around the graphic.

- **Format Picture** displays all the image properties in a separate window.

- **Reset Picture** will delete all the modifications made to the image.

AutoShapes

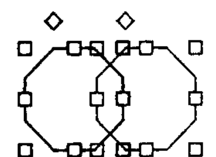
The AutoShapes toolbar will allow you to draw a number of geometrical shapes, arrows, flow chart elements, stars, and more on the worksheet. Activate the AutoShapes toolbar by selecting **Insert|Picture|AutoShapes** or **View|Toolbars|AutoShapes** from the menu bar. Click the button on the toolbar to view the options for drawing the shape.



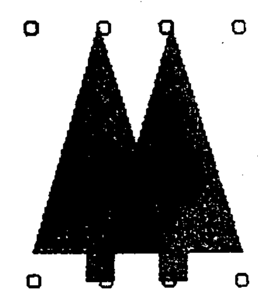
- **Lines** - After clicking the Lines button on the AutoShapes toolbar, draw a ***straight line, arrow***, or ***double-ended arrow*** from the first row of options by clicking the respective button. Click in the worksheet where you would like the line to begin and click again where it should end. To draw a *curved line* or ***freeform shape***, select curved lines from the menu (first and second buttons of second row), click in the worksheet where the line should appear, and click the mouse every time a curve

should begin. End creating the graphic by clicking on the starting point or pressing the ESC key. The *scribble* tool: click the button on the toolbar, then click the mouse in the worksheet and hold down the left button while you draw the design. Let go of the mouse button to stop drawing.

- **Connectors**: Draw these lines to connect flow chart elements.
- **Basic Shapes**: Click the Basic Shapes button on the AutoShapes toolbar to select from many *two- and three-dimensional shapes, icons, braces and brackets*. Use the drag-and-drop method to draw the shape in the worksheet. When the shape has been drawn, it can be resized using the open box handles and other adjustments specific to shapes can be modified using the yellow diamond handles.

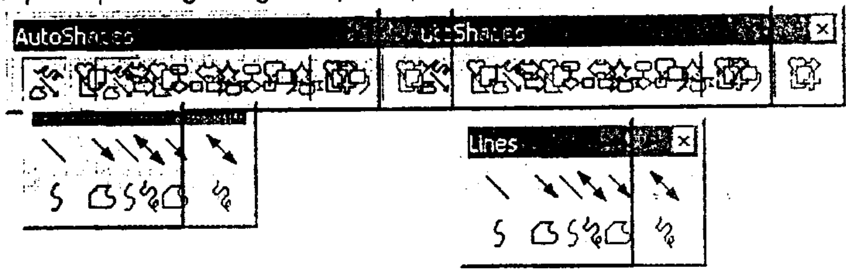


- **Block Arrows**: Select Block Arrows to choose from many types of *two- and three-dimensional arrows*. Drag-and-drop the arrow in the worksheet and use the open box and yellow diamond handles to adjust the arrowheads. Each AutoShape can also be rotated by first clicking the Free Rotate button on the drawing toolbar. Click and drag the green handles and bend the image to rotate it. The tree image below was created from an arrow rotated 90 degrees.



- **Flow Chart**: Choose from the flow chart menu to add *flow chart elements* to the worksheet and use the line menu to draw connections between the elements.
- **Stars and Banners**: Click the button to select *stars, bursts, banners, and scrolls*.
- **Call Outs**: Select from the *speech and thought bubbles, and line call outs*! Enter the call out text in the text box that is made.
- **More AutoShapes**: Click this button to choose from a list of clip art categories.

Each of the submenus on the AutoShapes toolbar can become a separate toolbar. First click and drag the gray bar across the top of the submenu off the toolbar and it will become a separate floating toolbar.



Charts

Charts allow you to present data entered into the worksheet in a visual format using a variety of graph types. Before you can make a chart you must first enter data into a worksheet. This page explains how you can create simple charts from the data.

Chart Wizard

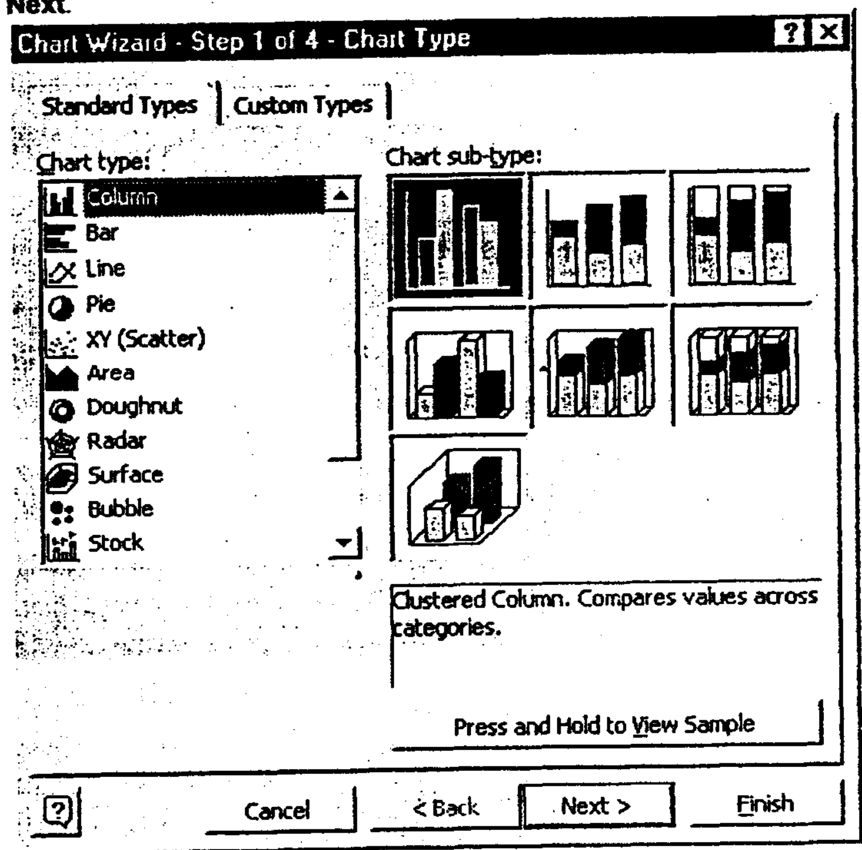
The Chart Wizard brings you through the process of creating a chart by displaying a series of dialog boxes.

1. Enter the data into the worksheet and highlight all the cells that will be included in the chart including headers.

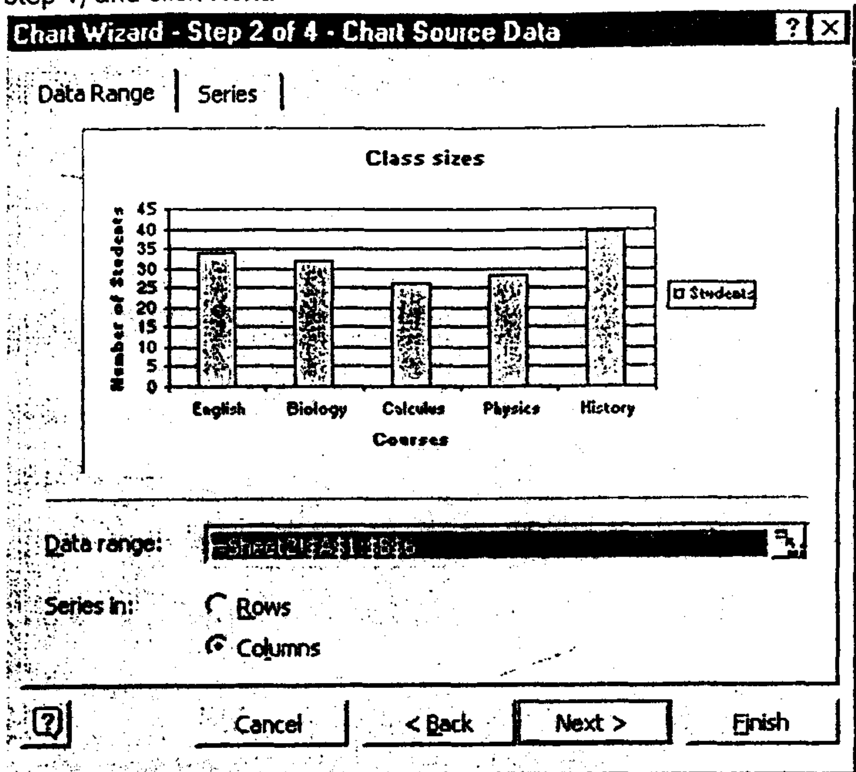
	A	B	C
1		Students	
2	English	34	
3	Biology	32	
4	Calculus	26	
5	Physics	28	
6	History	39	
7			

2. Click the Chart Wizard button on the standard toolbar to view the first **Chart Wizard** dialog box.

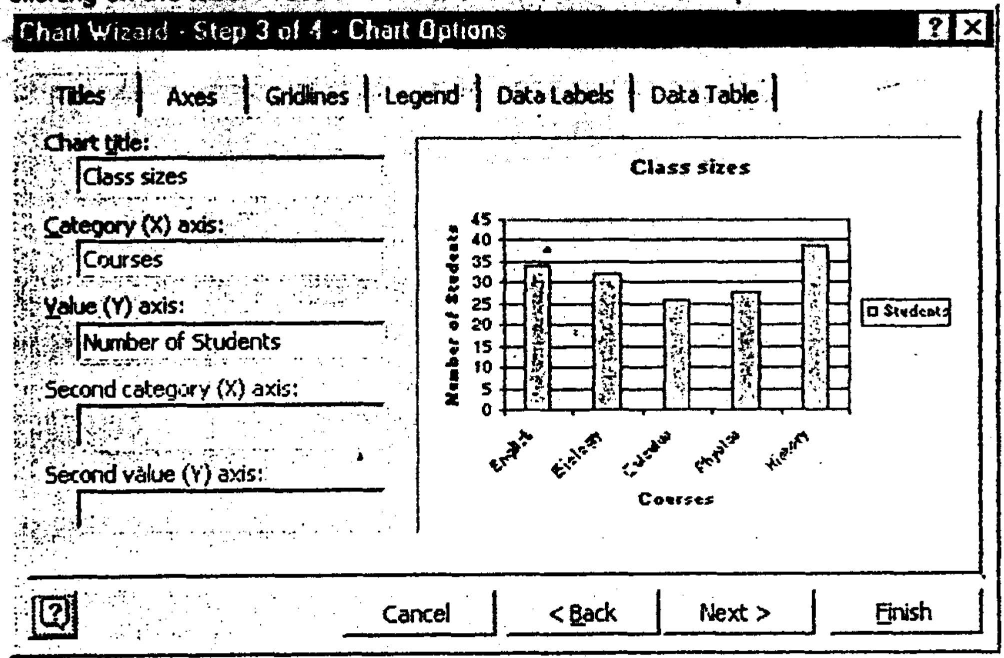
3. **Chart Type** - Choose the **Chart type** and the **Chart subtype** if necessary. Click **Next**.



4. **Chart Source Data** - Select the data range (if different from the area highlighted in step 1) and click **Next**.

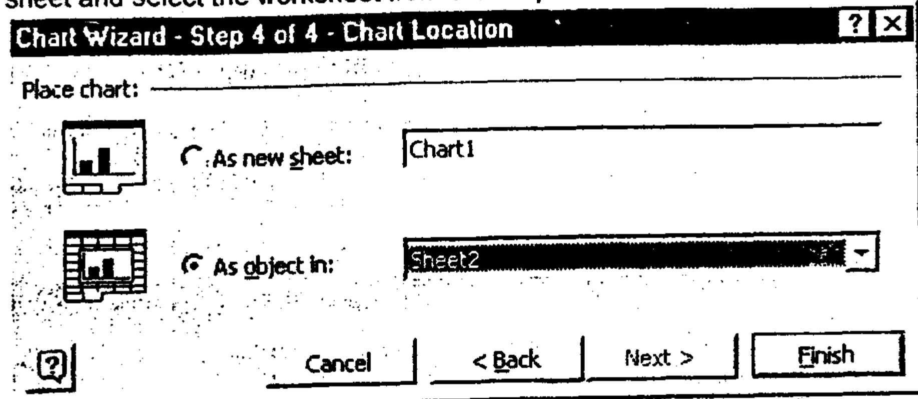


5. **Chart Options** - Enter the name of the chart and titles for the X- and Y-axes. Other options for the axes, grid lines, legend, data labels, and data table can be changed by clicking on the tabs. Press **Next** to move to the next set of options.

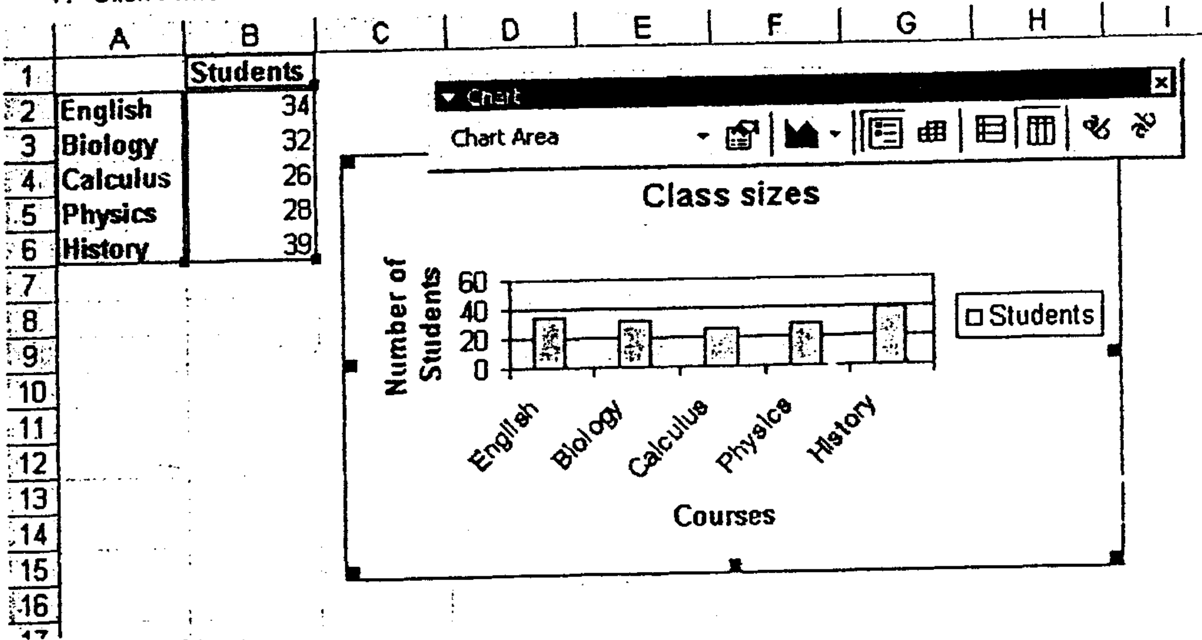


6. **Chart Location** - Click **As new sheet** if the chart should be placed on a new, blank worksheet or select **As object in** if the chart should be embedded in an existing

sheet and select the worksheet from the drop-down menu.



7. Click **Finish** to create the chart.



Resizing the Chart

To resize the chart, click on its border and drag any of the nine black handles to change the size. Handles on the corners will resize the chart proportionally while handles along the lines will stretch the chart.

Moving the Chart

Select the border of the chart, hold down the left mouse button, and drag the chart to a new location. Elements within the chart such as the title and labels may also be moved within the chart. Click on the element to activate it, and use the mouse to drag the element to move it.

Chart Formatting Toolbar

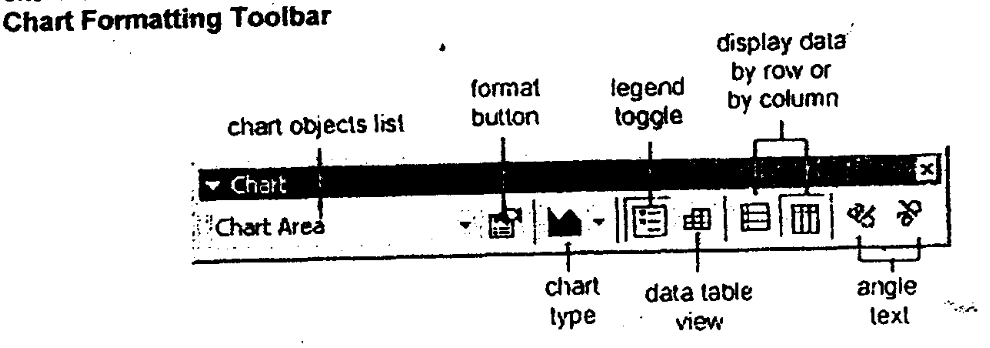


Chart Objects List - To select an object on the chart to format, click the object on the chart or select the object from the **Chart Objects List** and click the **Format button**. A window containing the properties of that object will then appear to make formatting changes.

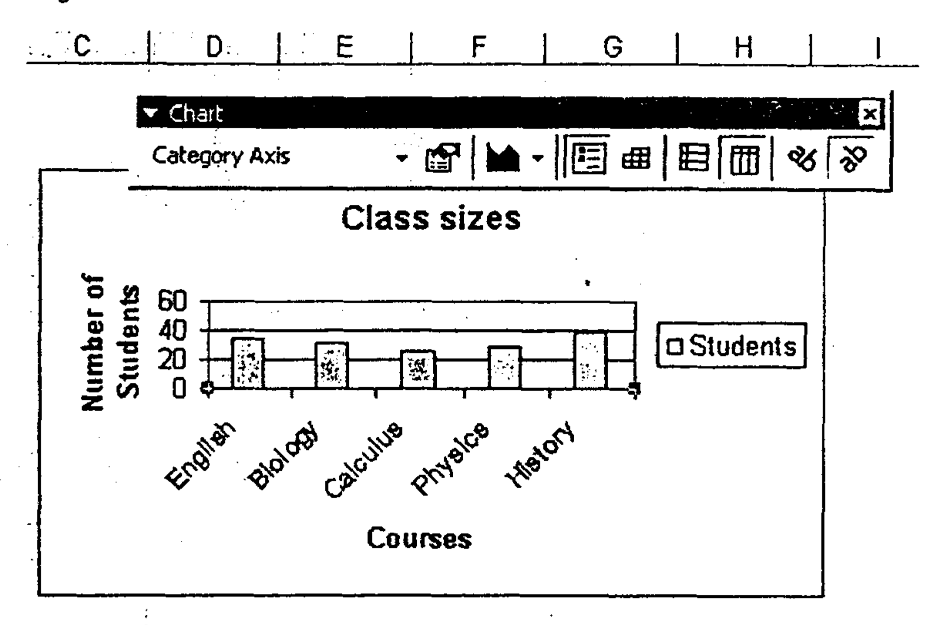
Chart Type - Click the arrowhead on the chart type button to select a different type of chart.

Legend Toggle - Show or hide the chart legend by clicking this toggle button.

Data Table view - Display the data table instead of the chart by clicking the Data Table toggle button.

Display Data by Column or Row - Charts the data by columns or rows according to the data sheet.

Angle Text - Select the category or value axis and click the **Angle Downward** or **Angle Upward** button to angle the the selected by +/- 45 degrees.



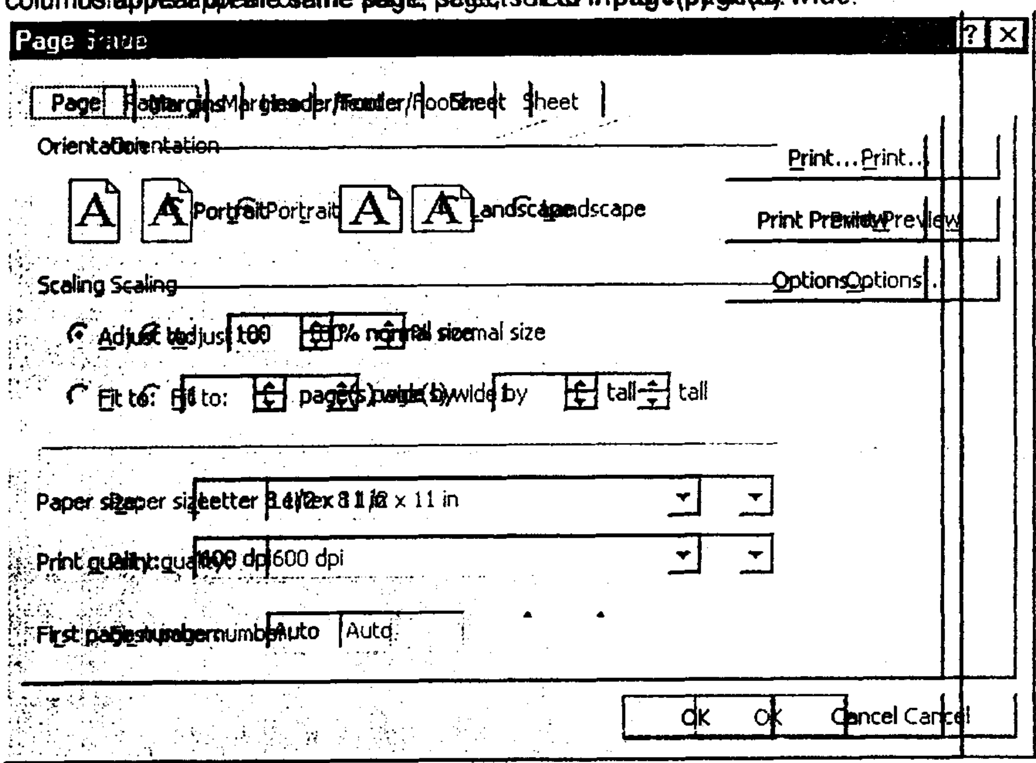
Copying the Chart to Microsoft Word
A finished chart can be copied into a Microsoft Word document. Select the chart and click **Copy**. Open the destination document in Word and click **Paste**.

Page Properties

Page Breaks
To set page breaks within the worksheet, select the row you want to appear just below the page break by clicking the row's label. Then choose **Insert|Page Break** from the menu bar. You may need to click the double arrow at the bottom of the menu list to view this option.

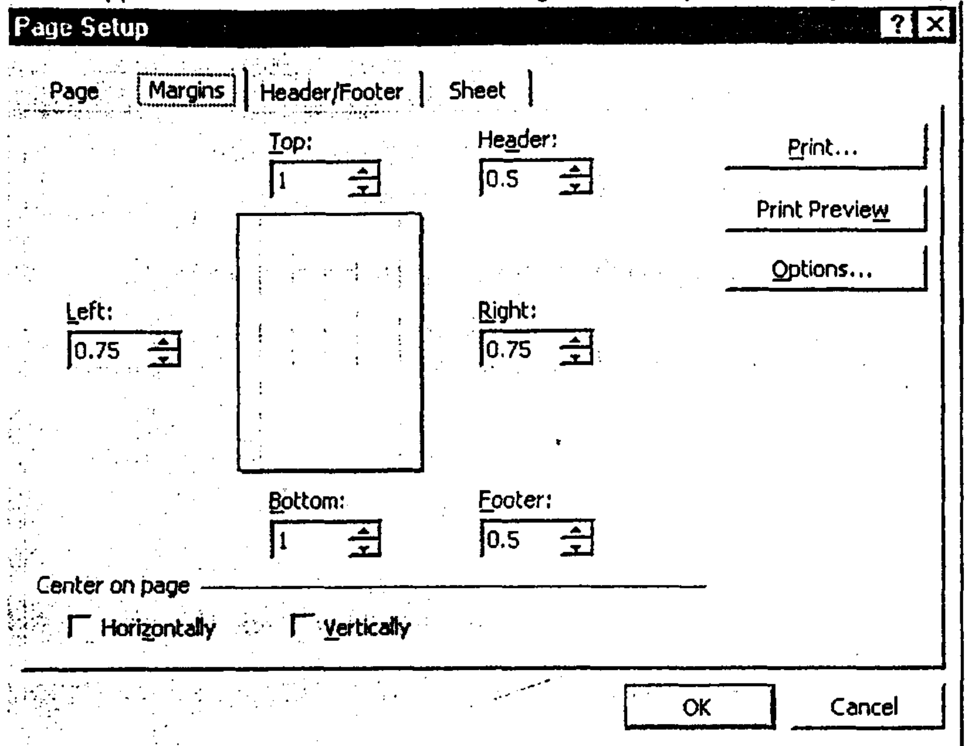
Page Setup
Select **File|Page Setup** from the menu bar to format the page, set margins, and add headers and footers.

- **Page**
  Select the **Orientation** under the Page tab in the Page Setup window to make the page landscape or portrait. The size of the worksheet on the page can also be formatted under **Scaling**. To force a worksheet to print on only one page wide so all the columns appear on the same page, select **Fit to 1 page(s) wide**.

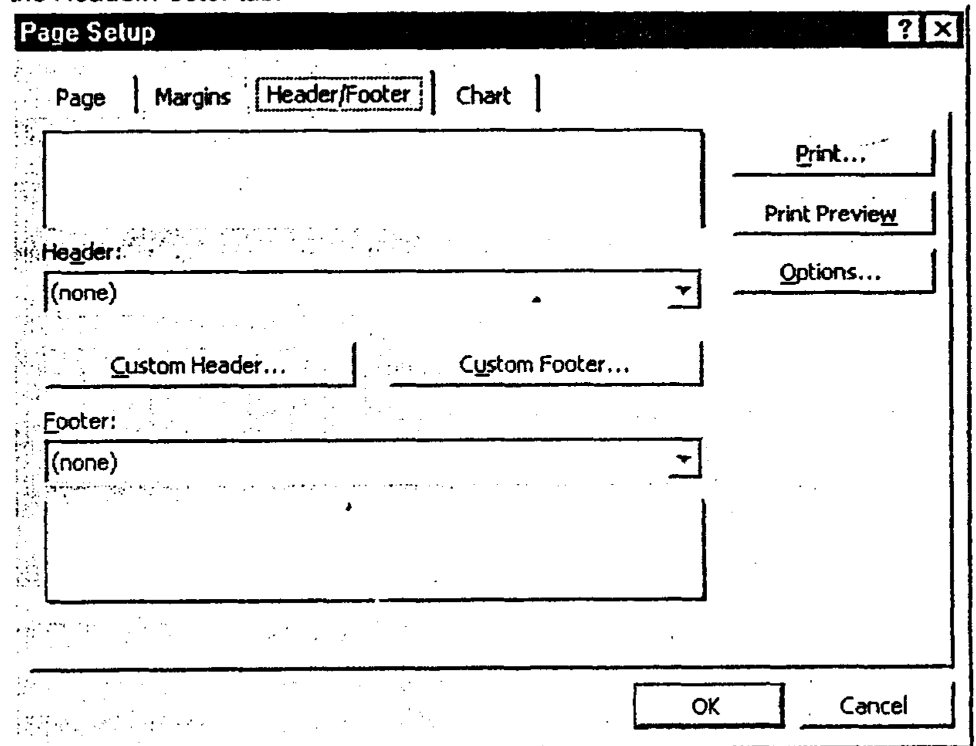


- **Margins**
  Change the top, bottom, left, and right margins under the **Margins** tab. Enter values in the header and footer fields to indicate how far from the edge of the page this text

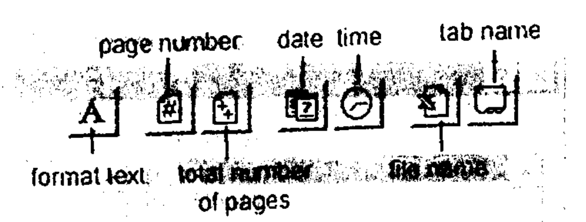
should appear. Check the boxes for centering horizontally or vertically on the page.



- **Header/Footer**
  Add preset headers and footers to the page by clicking the drop-down menus under the Header/Footer tab.



To modify a preset header or footer, or to make your own, click the **Custom Header** and **Custom Footer** buttons. A new window will open allowing you to enter text in the left, center, or right on the page.



Format Text - Click this button after highlighting the text to change the font, size, and style.
Page Number - Insert the page number of each page.
Total Number of Pages - Use this feature along with the page number to create strings such as "page 1 of 15".
Date - Add the current date.
Time - Add the current time.
File Name - Add the name of the workbook file.
Tab Name - Add the name of the worksheet's tab.

- **Sheet**
  Check **Gridlines** if you want the gridlines dividing the cells to be printed on the page. If the worksheet is several pages long and only the first page includes titles for the columns, select **Rows to repeat at top** to choose a title row that will be printed at the top of each page.

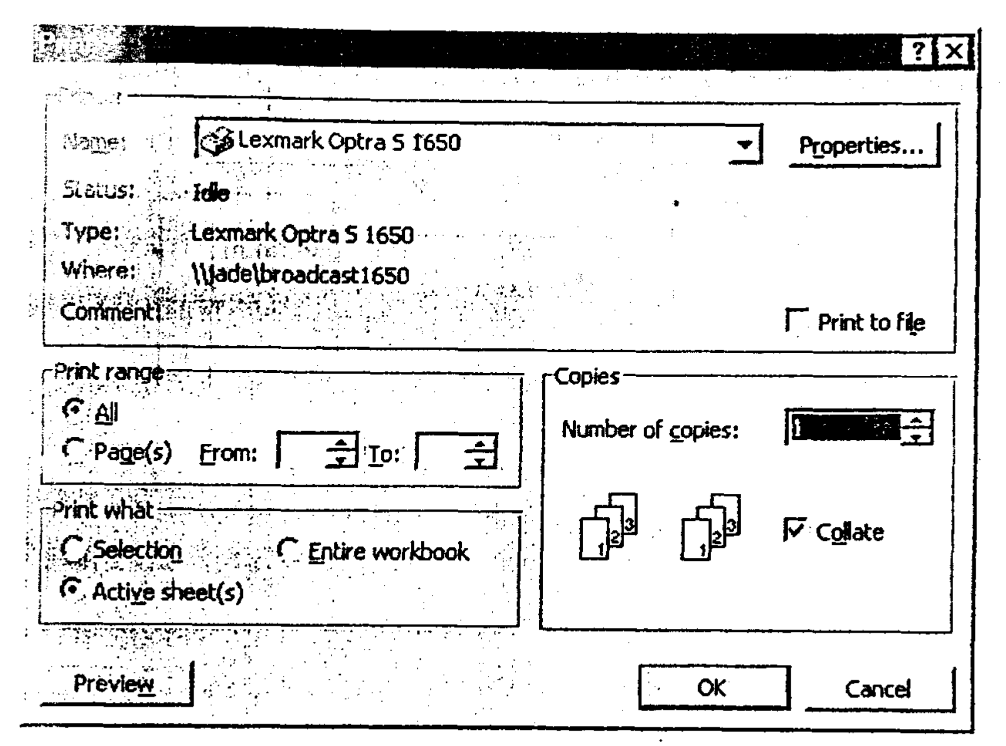
Page Setup

Page | Margins | Header/Footer | Sheet

Print area:
Print titles
Rows to repeat at top:
Columns to repeat at left:
Print
Gridlines
Row and column headings
Black and white
Comments: (None)
Draft quality
Page order
Down, then over
Over, then down

Print...
Print Preview
Options...
OK
Cancel

Print Preview
Select **File|Print Preview** from the menu bar to view how the worksheet will print. Click the **Next** and **Previous** buttons at the top of the window to display the pages and click the **Zoom** button to view the pages closer. Make page layout modifications needed by clicking the **Page Setup** button. Click **Close** to return to the worksheet or **Print** to continue printing.
Print
To print the worksheet, select **File|Print** from the menu bar.



- **Print Range** - Select either all pages or a range of pages to print.
- **Print What** - Select selection of cells highlighted on the worksheet, the active worksheet, or all the worksheets in the entire workbook.
- **Copies** - Choose the number of copies that should be printed. Check the **Collate** box if the pages should remain in order.

Click **OK** to print.

Keyboard Shortcuts

Keyboard shortcuts can save time and the effort of switching from the keyboard to the mouse to execute simple commands. Print this list of Excel keyboard shortcuts and keep it by your computer for a quick reference. Note: A plus sign indicates that the keys need to be pressed at the same time.

Action
Keystroke

Open a file
CTRL+O

New file
CTRL+N

Save As
F12

Save
CTRL+S

Print
CTRL+P

Find
CTRL+F

Replace
CTRL+H

Go to
F5

One cell up
up arrow

One cell down
down arrow

One cell right
Tab

One cell left
SHIFT+Tab

Top of worksheet (cell A1)
CTRL+Home

End of worksheet
(last cell with data)
CTRL+End

End of row

Italics
CTRL+I

Underline
CTRL+U

Strikethrough
CTRL+5

Edit active cell
F2

Format as currency with 2 decimal places
SHIFT+CTRL+$

Format as percent with no decimal places
SHIFT+CTRL+%

Cut
CTRL+X

Copy
CTRL+C

Paste
CTRL+V

Undo
CTRL+Z

Redo
CTRL+Y

Format cells dialog box
CTRL+1

Home

End of column
CTRL+left arrow

Move to next worksheet
CTRL+PageDown

Apply AutoSum
ALT+=

Current date
CTRL+;

Current time
CTRL+:

Spelling
F7

Help
F1

Macros
ALT+F8

■
Action
Keystroke

All cells left of current cell
SHIFT+left arrow

All cells right of current cell
SHIFT+right arrow

Entire column
CTRL+Spacebar

Entire row
SHIFT+Spacebar

Entire worksheet
CTRL+A

Bold
CTRL+B

